

Gray's Anatomy

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Anatomy, Descriptive and Surgical. By HENRY GRAY, F.R.S., Late Lecturer on Anatomy at St. George's Hospital, London. New American edition, enlarged and thoroughly revised, by J. Chalmers Da Costa, M.D., Professor of Surgery and Clinical Surgery, and Edward Anthony Spitzka, M.D., Professor of Anatomy in the Jefferson Medical College of Philadelphia. Imperial octavo, 1612 pages, with 1149 large and elaborate engravings. Price, with illustrations in colors, cloth, \$6.00, net; leather, \$7.00, net.

A new edition of *Gray's Anatomy* is a matter of importance to all concerned with any department of medicine, whether as students or practitioners. Henry Gray's transcendent genius combined a profound grasp of human structure with equal insight into the most effective methods of presenting it to other minds. His master-work therefore possesses a didactic quality which has never been approached. Its text is profusely illustrated with engravings so large that the names of the parts have been cut directly upon them, whereby the nomenclature, position, extent and relations of each part are seen at a glance, an advantage offered solely by "Gray," and of obvious importance when contrasted with the confusing system of reference lines and letters used in all other works. Colors are employed to show muscle insertions, veins, arteries, lymphatics and nerves. These features of "Gray" save the student half his time and effort in acquiring a knowledge of anatomy and double its permanence, points of almost equal importance to the teacher, as both are jointly interested in effective work during sessions and in success at collegiate and State license examinations. To sum up, this single volume unites a thorough text on descriptive anatomy with the most effective series of illustrations ever published, thus answering all needs of the student in the class-room (and serving also as an unrivalled dissector). Its sections on applied anatomy render it equally useful to the physician and surgeon for reference on anatomical points underlying the practice of medicine or surgery. In this new and thoroughly revised edition every page has been critically scrutinized, and the section on the Nerve System has been entirely rewritten. The illustrations have been correspondingly enriched with new and original

A critique of *Gray's Anatomy* can be written in but one word—masterpiece. This, the 17th edition, has been prepared by two men well qualified for such a serious undertaking—Prof. J. Chalmers Da Costa, the surgeon, and Prof. E. A. Spitzka, artist as well as teacher, one of the prominent American anatomists, and a particularly to neural anatomy. Spitzka has thoroughly, largely re-written it; are mostly new and excellent. In the text of thorough, painstaking

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This volume comprises the entire specialty of the nose and throat and by far the larger part of otology—the associated affections of the ear. The author considers each disease systematically and thoroughly, giving the etiology, pathology, methods of examination, symptoms, diagnosis and especially full directions for treatment. He details the necessary instruments, the steps of therapeutic technique, and the method and medication he has found most often successful in subduing the symptoms and shortening the course of each disease. He has thoroughly revised this new edition to represent the latest and best knowledge. A useful formulary closes the volume.

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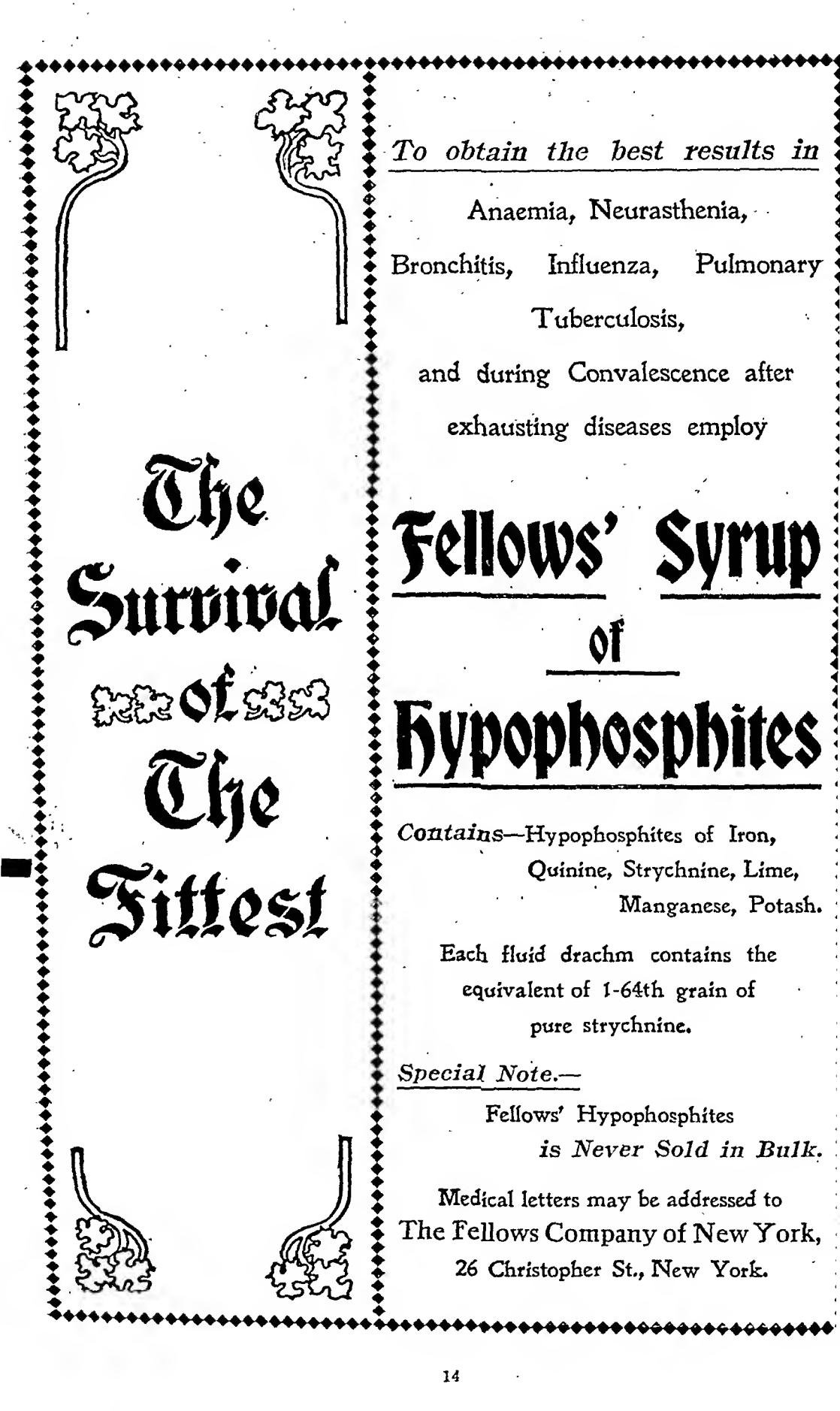
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~~of the American Journal of Medical
Sciences~~
Sciences by fire, it was necessary to reprint it.
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THE
AMERICAN JOURNAL
OF THE MEDICAL SCIENCES.

APRIL, 1909.

ORIGINAL ARTICLES.

SURGICAL ANEMIA AND RESUSCITATION.¹

BY GEORGE W. CRILE, M.D.,

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CLEVELAND, OHIO.

IT so happened that at the time I was invited to deliver this lecture, my research associate, Dr. D. H. Dolley, and I had reached a point in the investigation of one phase of the subject of surgical anemia, at which, in conjunction with my own previous experimental and clinical work, tentative generalizations seemed warranted. The following statements include, for the most part, generalizations of experimental and clinical observations. I have drawn heavily on the histological work of Dr. Dolley. It is not possible on this occasion to refer to the many valuable contributions he has made. From the literature I have drawn liberally upon the work of D'Halluin, Hill, Stewart, and his associates, as well as upon that of Sarbo, Marinesco, and Mott. A detailed publication of the data upon which the generalizations are based is contemplated later.

In the vegetable and in the animal kingdom functional activity and growth require an almost constant supply of food. Impairment or loss of this constant supply is followed by impairment or loss of function or by death. Increased or diminished food supply affects growth and function in infinite ways. Owing to environment and ultimate design, species respond differently to the loss of food. Neither individuals as a whole, nor their various parts, respond equally to a diminished or a complete loss of food. The histological elements of a given organ endure the various degrees of impairment

¹ The Mütter Lecture of the College of Physicians of Philadelphia, delivered December 11, 1908.
VOL. 137, NO. 4.—APRIL, 1909.

or loss of function differently. Death of an animal, therefore, falls unevenly upon its various tissues and organs. Undoubtedly, post-mortem examinations and burials are made while some of the tissues of the body are still living. The vital spark may smoulder or it may be extinguished. Death may be definitive or relative. Definitive death is a vital and final resolution and is irremediable. Relative death is a state of suspended animation.

Suspended animation is susceptible of re-animation or resuscitation. Suspended animation, as understood for our present purpose, is produced by a loss of food supply, and re-animation or resuscitation may be accomplished only by a supply of the required nourishment. Whether the needed chemical elements are supplied in gaseous form as oxygen, or in chemical combination as proteids, they all constitute food. The loss of this complex food supply will, for our present purpose, be designated anemia, and the anemia most frequently met in surgical practice I will designate surgical anemia.

Surgical anemia may be due to absolute loss of blood volume (hemorrhage); to segregation of the blood in the vascular system by disturbance of the vascular mechanism, as in shock or collapse; to local interruption of the circulation by mechanical means, such as thrombosis or embolism, strangulations, torsions, tourniquet, bandages, apparatus, pressure, etc. Whether considered with reference to the entire body or to a part, the result of a given anemia, whether partial or complete, is dependent upon the susceptibility or the resistance of the affected part to anemia.

It is not my purpose at this time to consider hemorrhage, shock, collapse, and the various mechanical agencies alluded to, any further than as to their role as a cause of surgical anemia. Disregarding, then, the mechanism of the cause of anemia, I will in a general way, as they relate to the practice of surgery, consider the phenomena of anemia and its treatment, namely, resuscitation.

To approach this subject, we first need to know the relative endurance of the various tissues and organs to anemia, hence their resuscitability. Turning to this point of our inquiry, we are at once confronted by many difficulties, the principal being the various degrees of susceptibility of not only organs as a whole, as the kidney and the brain, but the individual difference in susceptibility of the component cells of the various organs. Furthermore, certain functions of the organ may be lost while the cells performing these functions may survive. Again, some functions of the cells may be retained, while others may be lost. Finally the loss of function may be temporary; if so, have these cells been partially reconstructed physically? Many of these questions we are not prepared to answer. Indeed, as they relate to the practice of surgery many are not important. The finer metabolic changes, the ultimate method of re-animation or regeneration, may be left to the trained physiologist to determine. What we, as practitioners, want to know is, how long may the

various organs and tissues be deprived of their circulation and still be susceptible to resuscitation? How may resuscitation be best accomplished?

The skin may be removed, preserved for at least several weeks, then on proper planting may grow again. The voluntary muscles enter into a state of rigor mortis after an anemia of about twelve hours. The nerves ending in the muscles degenerate after a shorter period. The bones endure an anemia longer than the muscles. The tendons and connective tissue occupy a position probably between muscle and bone. In a decubitus, as a paralytic bedsore, one observes early necrosis of all the tissues lying between the skin and the bone, showing their greater susceptibility. As to the viscera, the kidney may endure anemia and anatomically survive after a total anemia of at least one hour. The intestinal tract may anatomically and physiologically survive between six and seven hours. The heart (Kuliabko) has been isolated and kept in refrigeration for forty-four hours and on perfusion with oxygenated defibrinated blood has again beat rhythmically. Blood vessels have been transplanted after isolation for many weeks and have been able to perform at least their passive function (Carrel, Guthrie). Just how long they may retain their viability has not been precisely determined.

The several parts of the central nervous system endure anemia in varying degrees. The respiratory centre may endure an anemia of from thirty to fifty minutes; the vasomotor and cardiac centres, about twenty to thirty minutes; the spinal cord, eight or ten minutes; the motor cortex, eight or ten minutes; that part of the brain presiding over consciousness, the intellect and the psychic state, six to seven minutes.

The foregoing are approximate figures and include only the grosser functions. They permit certain generalizations: (1) Tissues and organs of low specialization endure total anemia better than tissues and organs of high specialization; (2) in the central nervous system the component parts endure anemia according to their phylogeny (Stewart). The nerve tissue presiding over the basal functions of life endures anemia better than the nerve tissue which by the process of evolution differentiates the higher animals from the lower; (3) the weakest link in the entire vital chain in the central nervous system is that which presides over conscious life and its special manifestations; (4) the higher the development of the tissue the more sharply is the period of endurance to anemia marked. While the vasomotor and the respiratory centres may show very considerable variation in their resistance to anemia, the cerebrum varies but slightly.

The histological changes will be alluded to later. Having surveyed in a general and summarizing way the susceptibility to complete anemia of the various tissues and organs that may be of surgical interest, the natural corollary is an inquiry into the methods of resuscitation.

Resuscitation may be considered with reference to organs or tissues individually or to the body as a whole. The best resuscitation is prevention. Here, again, as in the inquiry as to the length of time the tissues and organs may endure total anemia, the subject is so large that details must be sacrificed to a survey of the general field. One is tempted to discuss the ischemic palsy of tight splints, forgotten Esmarch bandages, tourniquets, the pernicious use of a bandage applied directly to the skin over fractures, splint contact with bony prominences, making the heel bear the weight of the splint-bound leg, the long unshifted recumbency upon an unprotected glass- or metal-topped operating table, the pressure of the brachial plexus upon the head of the humerus when the hands are firmly tied above the head during operations, the indentations and insufficient protection of plaster-of-Paris bandages, the unchanged posture on unsuitable mattresses of unconscious or paralyzed patients who have lost the beneficent protection of pain, etc. All these ways and means of causing needless deformity, gangrene, and suffering tempt more consideration, but I must hasten to other problems.

In anemia due to external or mechanical agents the cause and the treatment are obvious. When due to occlusion of supplying vessels, is there a newer method of attack? The work of Carrel, Payr, and others has, at least, furnished means of possible substitution. The perfection of the technique of bloodvessel anastomosis, the success of heteroplastic transplantation of bloodvessels, the establishment of the substitution of a vein for an artery, the use of local, intraneurial, spinal, and nitrous-oxide-oxygen anesthesia to obviate shock in poor surgical risks, make it possible at least to determine to what extent the cases of thrombosis, embolism, aneurysm, or traumatic solution of continuity of vessel walls may be benefited by repair or by substitution of vessels. In addition, the direct transfusion of blood may meet the resulting emergencies of acute anemia due to shock and hemorrhage.

In the possible transplantation of organs we must reckon with the effect of anemia as well as with the technical difficulties of the operation. In anemia of the somatic and certain visceral parts there is ample warning and fair surgical opportunity; for even if death does occur, compensations, even regenerations, are generous. In anemia of the central nervous system the warning is momentary or absent, the damage wrought is swift and irremediable. Though the results of anemia here are swift and terrible and the resulting loss of function largely without compensation or repair, we still have left to us the vast and useful field of prevention. Among many subjects may be mentioned the prevention of partial but increasing anemia, due to pressure upon the spinal cord following injuries and tumors. In total cross lesion of the cord there remains no direct surgical problem, but in pressure upon the cord, even though there is but the slightest or even doubtful evidence of function remaining, a speedy

operative relief should be attempted, lest the resulting increase of pressure due to the consequent swelling or oozing may, by producing complete anemia, extinguish the remaining spark of life. Then, too, one must here reckon with the misleading shock phenomena (Sherrington) immediately following the trauma, causing a break in the synapses, mimicking for the time being the picture of a total cross lesion. Hill, Stewart, and others have shown that even a slight "dribble of blood" may for a time preserve vitality.

The brain is frequently subjected to local anemia from a variety of mechanical causes, such as gravity, embolism, ligature, and compression of the common or internal carotid arteries, and increased intracranial pressure.

Embolism of surgical interest may be produced by the washing away of the thrombus formed in the proximal stump of a ligated external carotid. This occurs approximately once in fifty such ligations. Ligation of the common or internal carotids, especially in the state of atheroma, in about one out of three cases, is followed by an anemia so marked that cerebral softening occurs. The younger the subject, the less prone to the sequence of softening. But it is the older and atheromatous subjects that usually require or are supposed to require, ligation. Ligation of the common or of the internal carotid has been most frequently performed as a part of the technique of excision of malignant tumors. A closer study of cancer invasion has shown that cancer attacks the wall of the artery only after it has broken through the capsule of the lymphatic glands and has extensively invaded the deep planes of the neck. It is doubtful whether or not such a case has ever been cured by operation. Our position, then, may be stated as follows: If the cancer has not invaded the wall of the artery, ligation is not necessary; if the wall has been invaded the case offers but a remote if any chance of cure. Is this slight chance worth a 33 per cent. risk of cerebral softening?

In aneurysms the development of the technique is constantly diminishing the number of ligations.

As to the ligation of the common or the internal carotids for the arrest of hemorrhage, our means of successfully combating it by methods not bearing the risk of cerebral softening are almost uniformly adequate. In young subjects the sequence of softening is rarely observed. But what young patient requires such ligation? If, however, ligation must be performed, if time permits, a series of preliminary compressions of the artery, either by applying a clamp directly or by indirect external pressure, apparently widens the collateral blood paths, rendering occlusion less harmful. This is apparently established by both clinical and experimental evidence. Temporary closure of the common carotid by means of a special clamp has been done by me nearly one hundred times. In a few cases I simultaneously closed both common carotids. In addition I have frequently placed the patient in a sharp feet-down

inclined posture to enlist the additional aid of gravity in minimizing the venous hemorrhage. The results with respect to the circulation through the brain may be summarized as follows:

In cases of simultaneous closure of both carotids but little anesthetic was required; in one instance respiration failed; in three, recovery of consciousness was delayed. These phenomena were such unmistakable signals of danger from anemia that simultaneous double closure was abandoned. In atherosomatous subjects closure of one internal carotid in prolonged operations has been followed by delayed postoperative recovery of consciousness. In one case, in which, in addition, the patient was in a markedly inclined feet-down posture, there was fairly well-marked delirium during three days following the operation. Normal convalescence followed. These were undoubtedly examples of anemia sequences.

These observations led me further to modify the technique by first closing the common carotid and maintaining the horizontal position until the dissection has been carried to the bifurcation of the carotid, when the clamp is transferred to the external carotid. The blood path now being opened to the brain, no harm follows the inclined feet-down posture. I have observed no anemic phenomena in cases thus handled. Not only does the transfer of the clamp to the external carotid remove the risk of brain anemia, but the closure of the external carotid prevents the moderate bleeding from the reverse current when the common carotid only is closed. Then why is not the external the artery of choice? Because the usual occasion for such a dissection is for the eradication of cancer. Entering the neck to secure the external carotid involves a dissection in a region of frequent metastasis, and so the risk of making a local dissemination of the growth, thus defeating the purpose of the operation. With this exception, the external is the artery of choice, especially in elderly subjects.

After certain operations it is desirable to keep the patient in a sitting or half-sitting posture. In such cases the cerebral circulation, which gravity tends to diminish, may be measurably protected by efficient bandaging over rough elastic cotton to the costal border, or the use of the pneumatic rubber suit under firm distention.

Turning from regional cerebral anemia to the diminution or interruption of the blood current in the supplying arteries, I will consider anemia due to local and mechanical causes originating and operating within the skull. Any consideration of this portion of my theme must represent in a large measure the work of distinguished surgeons of this society.

While the rigid skull gives protection from external violence, every point of such protecting quality becomes a corresponding menace from certain pathological states within. How slight is the factor of safety when the brain is subjected to increased intracranial tension! The principal factor of safety is the displacement of cerebrospinal

fluid and the increased general blood pressure in a protective response to the oncoming anemia.

The management of increased intracranial tension may be illustrated by a common form—traumatic hemorrhage. For the purpose of discussing certain practical points relating to the impaired circulation and consequent anemia, intracranial hemorrhages may, with respect to their degree, be roughly classified as follows: In the first stage, that of developing stupor, falling pulse rate, and rising blood pressure, the margin of operative risk is ample, complete anemia is not immediately threatened, and the prognosis is good. In the second stage, that of deep stupor, subtotal or total unconsciousness, slow but rhythmic pulse and maximum but even blood pressure, the margin of operative risk is slender, the prognosis uncertain. In such cases all the sails of compensation are set. There is probably only a slight circulation through certain portions of the brain. Even a moderate fall in the blood pressure due to hemorrhage, shock, or anesthetic complications may leave the cortex in total anemia, which if at all prolonged, say seven or eight minutes, will result in fatal degenerations. In the third stage, that of complete unconsciousness, irregular pulse rate and rhythm, high but irregular blood pressure, anemic degenerations may have already occurred, or there may remain a slight dribble of blood forced in at the crest of the oscillating blood pressure waves, perhaps even at the crest of the respiratory wave. This slight circulation may be barely holding the spark of life. Surgical relief by a faultless technique may save an occasional member of this group. In the fourth stage, that in which the pulse is rapid and the blood pressure falling, the powerful blood pressure mechanism has spent its force and is broken, the brain is in complete anemia, and widespread degeneration has occurred. The higher-brain individual is dead, while the remainder of the body lives.

This is merely a crude and artificial sketch of the stages through which the brain may pass in the various degrees of anemia due to increased intracranial pressure. The surgical approach here must be as physiological as possible. Not only must there be no depression of the circulation, but support should be given. The blood pressure should be supported by therapeutic and by mechanical means. The posture should be horizontal or head down, the extremities and the abdomen to the costal borders subjected to pressure or bandaging over cotton. The most important consideration, however, is prompt operative decompression. How many of these cases, still dimly conscious, are subjected to the routine method of "interne" anesthesia, of needless hemorrhage, and a shock producing technique. The diagnosis may be correct, a large mass of clot removed, the circulation and the respiration may at once improve, and the surgeon may be entirely satisfied. All is well, but the patient does not regain consciousness and dies. Such a picture I can vividly

recall from personal experience. Causes of increased intracranial tension need strict physiological interpretation.

With this brief and imperfect survey of surgical anemia from local causes, and local resuscitation, I will discuss from the experimental and clinical standpoints resuscitation of the individual as a whole.

After testing current methods and noting their shortcomings, resuscitation was approached from the arterial side, with the following physiological factors as a basis: The physiological researches of Ringer, Kuliabko, Stewart, Sollman, and others had shown that the excised heart could be made to beat again, even many hours after excision, when the coronary arteries were subjected to a considerable pressure from the circulating medium. The researches of Sollman showed that the inauguration of the heart beat was more dependent upon the physical factor of the increased pressure in the coronary arteries than upon the quality of the fluid producing such pressure. He was able to inaugurate cardiac beats by perfusing the coronaries with metallic mercury. The basic problem, then, in resuscitation seemed to us to be that of securing by means of some infusion a coronary pressure in the intact animal to this height by means of cardiac massage alone; it was almost impossible to raise it by means of infusion of artificial sera alone, and generally impossible to raise it to this height by means of cardiac massage and plain infusion combined.

The value of adrenalin in raising the blood pressure, by its action upon the vascular walls in the state of suspended animation, has already been thoroughly established. Introducing the adrenalin into the venous circulation, while easy and practical, had the following disadvantage: the adrenalin first came in contact with the vessels having the least power of influencing the blood pressure, and before a material rise could be affected by its action upon the arteries it was necessary that the solution should pass through the right heart, the lungs, and then back to the left heart on its way to the aorta, then finally affecting the coronary arteries. In a previous research it was found that this too often caused an accumulation of solution and blood in the dilated paralyzed chambers of the heart, defeating resuscitation.

It seemed reasonable to us to suppose that the most direct and effective way of producing a coronary pressure amounting to 40 or more mm. of mercury was by introducing a solution of adrenalin into the arterial system toward the heart. In this way the moment the adrenalin was introduced it caused a contraction of the strong arterial walls, and began to produce an arterial pressure which was communicated directly to the coronary arteries without first passing directly through the already distended and paralyzed chambers of the heart and through the lungs. These considerations were strongly impressed upon us by a clinical case of suspended animation in the

course of a cerebellar operation on a child, which was unexpectedly resuscitated by centripetal arterial infusion of adrenalin.

The following will serve as an illustration: An animal was killed by chloroform. A cannula was inserted into the femoral artery, and directed toward the heart. After five minutes artificial respirations were begun and the saline solution was allowed to flow for perhaps ten seconds; then a hypodermic injection of from 1 to 2 c.c. of 1 to 1000 solution of adrenalin was given into the tube near the cannula. A few seconds later the blood pressure began to rise steadily; then a few firm pressures upon the thorax over the heart caused a leaping up of high pulse waves, and at the end of three-quarters of a minute the heart beat vigorously, driving the blood up into the infusion bottle, which had been to the height of five feet. The saline injection and the cardiac massage were discontinued, and in a few minutes irregular respirations began slowly, and increased in force and frequency until the normal was established. The animal was then definitely killed.

Having established an effective technique for resuscitation, we then investigated the physiological and histological sequels of the resulting anemia. The laborious task of collecting these data was undertaken by my colleague, Dr. David H. Dolley.

In general the following sequence of return of the various functions and reflexes was exhibited: vasomotor action, respiration, corneal reflex and knee-jerk (tendon reflexes in general), winking, cutaneous reflexes, partial or complete contraction of the pupils, and light reflex. This order was subject to considerable variation, which will be considered under the special discussions of functions and reflexes. Hypertonicity of the voluntary musculature immediately succeeded recovery of a normal tone and was manifested by exaggeration of the knee-jerks, if not by a more or less widespread spastic condition. It always followed rapidly the re-appearance of the knee-jerk. Reflex muscular movements, secondary to skin or tendon stimulation, always preceded those of spontaneous origin. Spontaneous incoordinate movements appeared sometimes before, sometimes after the light reflex, but afterward only when it returned relatively early. Coördinate movements followed quickly in dogs subjected to short periods of anemia, so that perhaps the incoordinate did not appear, but the resumption of muscular activity was sudden, the dog starting up as though suddenly roused from sleep. Succeeding the coordinate movements there came what may be classed as purposeful movements, involving all the muscles of locomotion and expressed in such actions as attempts to turn over, to rise, or to crawl forward. Usually after the appearance of coordinate movements, less frequently about the same time, visual and auditory reactions were obtained. The auditory was always the more definite and usually returned first. It is the combination of the return of the special senses with purposeful muscular movements, altogether or in

part, that is termed consciousness, though it is usually very dim and uncertain. In many of the dogs that succumbed, after some hours there was more than a mere reflex revival, there being some manifestation of the higher faculties in addition.

SUMMARY. To determine the limits of recovery after a total anemia of the central nervous system, 20 dogs were killed by chloroform and resuscitated after varying times from three to fourteen minutes. Under five minutes the recovery of function was rapid and strikingly free from the after-effects which characterized longer periods. Of seven animals, resuscitated between the periods of five and six and one-half minutes, only one died, apparently as a direct result of the anemia; but of 12 resuscitated between the periods of seven and eight and one-half minutes, only one, after seven and one-half minutes, recovered. The remaining dogs all died.

Histological examination both of presumptive recoveries and fatal cases was made by ordinary methods and those of Nissl and Marchi. The neurocytes of the fatal cases uniformly presented the greatest changes, not merely chromolytic but here and there definitely indicative of cell death. Marchi's method further supported these findings by proving the existence of fiber degeneration. Finally, showing the narrowness of the escape, the best result in recovery, seven and one-half minutes in time, which at the end of four weeks had apparently entirely returned to a normal state, by the Marchi method had a degeneration of a number of fibers localized in the pyramidal fasciculi which were traced from the cord to the cortex, and in Flehsig's fasciculus, as well as a more sparsely scattered degeneration of both ascending and descending fibers elsewhere.

In human resuscitation the technique is as follows: The patient in the prone posture is subjected at once to rapid rhythmic pressure upon the chest, with one hand on each side of the sternum. This pressure produces artificial respiration and a moderate artificial circulation. A cannula is inserted toward the heart into an artery. Normal saline, Ringer's, or Loeke's solution, or, in their absence, sterile water, or, in extremis, even tap water, is infused by means of a funnel and rubber tubing. But as soon as the flow has begun the rubber tubing near the cannula is pierced with the needle of a hypodermic syringe loaded with 1 to 1000 adrenalin chloride and 15 to 30 minims is at once injected. Repeat the injection in a minute if needed. Synchronously with the injection of the adrenalin the rhythmic pressure upon the thorax is brought to a maximum. The resulting artificial circulation distributes the adrenalin that spreads its stimulating contact with the arteries, bringing a wave of powerful contractions and producing a rising arterial, hence coronary pressure. When the coronary pressure rises to, say, 40 mm. or more, the heart is likely to spring into action. The first result of such action is to spread still further the blood pressure-raising adrenalin, causing a further and vigorous rise in blood pressure, possibly even doubling

the normal. The excessively high pressure is most favorable to the resuscitation of tissue, especially of the central nervous system (Stewart). Just as soon as the heart beat is established the cannula should be withdrawn, first, because it is no longer needed, and second, because the rising blood pressure will drive a torrent of blood into the tube and funnel. Unless there has been hemorrhage, the only object in the use of saline infusion is to serve as a means of introducing the adrenalin into the arterial circulation toward the heart. Bandaging the extremities and abdomen tightly over masses of cotton is very useful.

From a personal experience in attempts at resuscitation of the human being, I have been impressed by two main facts: (1) The human heart seems to respond even more readily than the heart of a dog; (2) the possibility of drilling an operative staff so that the technique may be begun within two minutes.

Prior to our knowledge as to the remarkably rapid degeneration of the central nervous system I attempted a variety of cases, including drowning, electrocutions from live wire accidents, and traumatisms. I usually succeeded in establishing a heart beat, sometimes a fairly good respiratory rhythm. In one case the patient lived some days, but did not regain consciousness. Only one recovered. The most interesting case was that done by my staff at Lakeside Hospital. In the course of a neck dissection the patient suddenly collapsed. The heart, the vasomotor, the cardiac, and the respiratory centres, after approximately nine minutes of total anemia, were resuscitated. The patient died in twenty-four hours. Consciousness did not return; the pupils remained dilated, the lids half closed; there was complete muscular relaxation; the special senses were all paralyzed; all reflexes were lost; he was in appearance and in fact a decerebrate.

This method of resuscitation may be quickly executed. It involves but a slight operation. It does not in itself complicate the patient's chance for ultimate recovery.

Centripetal arterial infusion with adrenalin combined with rhythmic pressure on the chest seems to be a more effective method than that by the use of stimulants, nitroglycerin, intravenous infusions, electricity, needling the heart, and even of direct cardiac massage. We must admire the courage and the boldness of the surgeons who have attempted resuscitation by direct cardiac massage. According to our present views, in many of these cases the brain was dead before the cardiac massage was even begun. There are degrees of anemia, hence there are degrees of resuscitation.

In hemorrhage and in shock the blood pressure may be so low as to cause temporary damage to the central nervous system. An analogous degeneration is seen in pernicious anemia. Bearing in mind its grave consequences, anemia should not, if possible, be permitted beyond a certain degree. Should other measures fail, the direct transfusion of blood is, in uncomplicated cases, virtually a specific

remedy. Not only the various tissues and organs of the body but the various component histological elements have an unequal endurance of anemia. Bone, connective tissue, muscle, skin, abdominal and thoracic viscera, special glands, and the heart and blood-vessels endure anemia many times longer than the central nervous system. The medulla endures anemia much better than the cerebrum. The higher the function the greater is the susceptibility to anemia. Histological changes are definite. Resuscitation to be effective must be timely. Timely resuscitation can only be done by having ever in readiness the materials needed for the technique.

THE INFLUENCE OF EMOTIONAL STATES ON THE FUNCTIONS OF THE ALIMENTARY CANAL.¹

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THE contraction of bloodvessels with resulting pallor, the pouring out of "cold sweat," the stopping of salivary secretion so that the "tongue cleaves to the roof of the mouth," the dilatation of the pupils, the erection of the hairs, the rapid beating of the heart, the hurried breathing, the trembling and twitching of facial muscles, especially those of the lips—all these bodily changes are well recognized attendants of major emotional disturbances, such as fear, horror, and deep disgust. It is well known also that these changes occur chiefly in structures supplied with smooth muscle and innervated through the sympathetic nervous system. But these bodily emotional alterations, commonly noted, are mainly superficial and readily observable. Even the increased rapidity of the heart beat manifests itself in the periphery. There are, however, other viscera, supplied with smooth muscle and innervated by sympathetic fibers, which are hidden deeply in the body and which do not reveal so obviously as do the structures already mentioned the disturbances of function accompanying affective states. Special methods must be used to determine whether these organs also are included in the complex of an emotional agitation.

The bladder, for example, as Mosso has shown, is extraordinarily sensitive to mental states involving interest and attention.² That the tone of the bladder is much increased during excitement might be inferred from the common experience of soldiers before moving

¹ In the use of the term "emotion" in this paper the meaning is not restricted to violent affective states, but includes "feelings" and other affective experiences. The term is also used in the popular manner, as if the "feeling" preceded the bodily change.

² Decennial Celebration, Clark University, 1899, p. 396.

into the firing line, of students facing the ordeal of an examination, of speakers about to go before an audience—in all these instances the increasing tone of the bladder muscle makes an insistent demand. The observations of the physiologist have merely refined these general experiences and made clear the paths of the nervous impulses and the degree of sensitiveness of the peripheral organ to excitation in the central nervous system.

The development of our knowledge of the relations of emotions to the functioning of the alimentary canal is similar. There are references in medical and other literature to the effects, favorable and unfavorable, of mental states on digestion. These instances are not uncommon in the observations of medical practitioners. The recent studies by the physiologists have merely proved specifically and in detail the disorders of function which ensue when feelings are aroused. It will be of interest to note some of the conditions attended by digestive disturbances, and later the refinements of our knowledge of these conditions discovered by recent experimental work, and certain practical conclusions to be drawn therefrom.

An interesting case illustrating the influence of a mental state on the activities of the alimentary canal is given by Burton³ in his *Anatomy of Melancholy*. "A gentlewoman of the same city saw a fat hog cut up, when the entrails were opened, and a noisome savour offended her nose, she much disliked, and would not longer abide; a physician in presence told her, as that hog, so was she, full of filthy excrements, and aggravated the matter by some other loathsome instances, insomuch this nice gentlewoman apprehended it so deeply that she fell forthwith a vomiting, was so mightily distempered in mind and body, that with all his art and persuasion, for some months after, he could not restore her to herself again, she could not forget or remove the object out of her sight." Truly, here was a moving circle of causation, in which the physician himself probably played the part of a recurrent augmenter of the trouble. The first disgust disturbed the stomach, and the disturbance of the stomach, in turn, aroused in the mind greater disgust, and thus between them the influences continued to and fro until digestion was impaired and serious functional derangement supervened. The stomach is "king of the belly," quotes Burton, "for if he is affected all the rest suffer with him."

Müller⁴ has reported the case of a young woman whose lover had broken the engagement of marriage. She wept in bitter sorrow for several days, and during that time vomited whatever food she took. But not all cases are so severe in their visceral manifestations as this. Sometimes the conditions of mental discord are merely attended by a sense of gastric inertia. For example, another

³ The Anatomy of Melancholy (first published in 1621), London, 1886, Part I, p. 443.

⁴ Deut. Arch. f. klin. Med., 1907, lxxxix, 434.

patient described by Müller testified that anxiety was always accompanied by a feeling of weight in the epigastrium, as if the food remained in the stomach. Every addition of food caused an increase of the trouble. Strong emotional states in this instance led almost always to gastric distress, which persisted, according to the grade and the duration of the psychic disturbance, between a half hour and several days. The patient was not hysterical or neurasthenic, but was a very sensitive woman deeply affected by moods.

These cases are merely illustrative, and doubtless can be many times duplicated in the experience of any physician concerned largely with digestive disorders. Indeed, the opinion is expressed that a large percentage of the cases of gastric indigestion that come for treatment are functional in character and of nervous origin. It is the emotional element that seems most characteristic of these cases. To so great an extent is this true that Rosenbach⁵ has suggested that as a characterization of the etiology of the disturbances, "emotional dyspepsia" is a better term than "nervous dyspepsia."

In recent physiological studies of the alimentary canal the importance of emotional states to normal digestion has received striking confirmation. The motility and the secretory activity have both been proved to be closely dependent on the nature of the excitation in the central nervous system. Pawlow's well-known observations showed the importance of appetite and a relish for food in starting the secretions of the stomach. These observations on dogs have been almost completely confirmed by studies of human beings having oesophageal obstruction and gastric fistula. Hornborg,⁶ Cade and Latarjet,⁷ Bogen,⁸ and others have reported in detail studies of such cases. Hornborg found that when the boy whom he studied chewed agreeable food a more or less active secretion of the gastric juice was started, whereas the chewing of indifferent material was without influence.

Not only is it true that normal secretion is favored by pleasurable sensations during mastication, but also that unpleasant feelings, such as vexation and some of the major emotions, are accompanied by a failure of secretion. Thus Hornborg was unable to confirm in his patient the observation of Pawlow that mere sight of food to a hungry subject causes the flow of gastric juice. Hornborg explains the difference between his and Pawlow's results by the difference in the reaction of the subjects to the situation. When food was shown, but withheld, Pawlow's hungry dogs were all eagerness to secure it, and the juice at once began to flow. Hornborg's little boy, on the contrary, became vexed when he could not eat at once, and began to cry; then no secretion appeared. Bogen also reports that his

⁵ Berl. klin. Woeh., 1897, xxxiv, 71.

⁶ Skandinavische Arch. der Phys., 1904, xv, 248.

⁷ Jour. de phys. et path. gén., 1905, vii, 221.

⁸ Arch. f. die ges. Phys., 1907, cxvii, 158.

patient, a child, aged three and a half years, sometimes fell into such a passion in consequence of vain hoping for food that the giving of the food, after calming the child, was not followed by any secretion of the gastric juice.

The observations of Bickel and Sasaki⁹ confirm and define more precisely the inhibitory effects of violent emotion on gastric secretion. They studied these effects on a dog with an oesophageal fistula, and with a side pouch of the stomach, which, according to Pawlow's method, opened only to the exterior. If the animal was permitted to eat while the oesophageal fistula was open, the food passed out through the fistula and did not go to the stomach. Bickel and Sasaki confirmed the observation of Pawlow that this sham feeding is attended by a copious flow of gastric juice, a true "psychic secretion," resulting from the pleasurable taste of the food. In a typical instance the sham feeding lasted five minutes, and the secretion continued for twenty minutes, during which time 66.7 c.c. of pure gastric juice was produced.

On another day a cat was brought into the presence of the dog, whereupon the dog flew into a great fury. The cat was soon removed, and the dog pacified. Now the dog was again given the sham feeding for five minutes. In spite of the fact that the animal was hungry and ate eagerly, there was no secretion worthy of mention. During a period of twenty minutes, corresponding to the previous observation, only 9 c.c. of acid fluid was produced, and this was rich in mucus. It is evident that in the dog, as in the boy observed by Bogen, strong emotions can so profoundly disarrange the mechanisms of secretion that the natural nervous excitation accompanying the taking of food cannot cause the normal flow.

On another occasion Bickel and Sasaki started gastric secretion in the dog by sham feeding, and when the flow of gastric juice had reached a certain height, the dog was infuriated for five minutes by the presence of the cat. During the next fifteen minutes there appeared only a few drops of a very mucous secretion. Evidently in this instance a physiological process, started as an accompaniment of a psychic state quietly pleasurable in character, was almost entirely stopped by another psychic state violent in character.

It is noteworthy that in both the positive and negative results of the emotional excitement illustrated in Bickel and Sasaki's dog the effects persisted long after the removal of the exciting condition. This fact Bickel¹⁰ was able to confirm in a girl with oesophageal and gastric fistulas; the gastric secretion long outlasted the period of eating, although no food entered the stomach. The importance of these observations to personal economies is too obvious to require elaboration.

Not only are the secretory activities of the stomach unfavorably

⁹ Deut. med. Woch., 1905, xxxi, 1829.

¹⁰ Berl. klin. Woch., 1906, xlvi, 845.

affected by strong emotions; the movements of the stomach as well, and, indeed, the movements of almost the entire alimentary canal,¹¹ are wholly stopped during excitement. In my earliest observations on the movements of the stomach¹² I had difficulty, because in some animals the peristalsis was perfectly evident and in others there was no sign of activity. Several weeks passed before I discovered that this difference in response to the presence of food in the stomach was associated with a difference of sex: the male cats were restive and excited on being fastened to the holder, and under these circumstances gastric peristalsis was absent; the female cats, especially if elderly, submitted with calmness to the restraint, and in them peristaltic waves took their normal course. Once a female with kittens turned from her state of quiet contentment to one of apparent restless anxiety. The movements of the stomach immediately stopped, and only started again after the animal had been petted and had begun to purr. I later found that by covering the cat's mouth and nose with the fingers until a slight distress of breathing occurred, the stomach movements could be stopped at will. Thus, in the cat any sign of rage, such as Bickel and Sasaki's dog manifested, or distress, or mere anxiety, was accompanied by a total cessation of the movements of the stomach. I have watched with the x-rays the stomach of a male cat for more than an hour, during which time there was not the slightest beginning of peristaltic activity, and yet the only visible indication of excitement in the animal was a continued to-and-fro twitching of the tail.

What is true of the cat has been proved true also of the rabbit, dog, and guinea-pig—even slight psychic disturbances were accompanied by stoppages of peristalsis.¹³ My observations on the rabbit have been confirmed by Auer,¹⁴ who found that the handling of the animal incident to fastening it gently to a holder stopped gastric peristalsis for a variable length of time. And if the animal was startled in any way, or struggled, peristalsis was again abolished. The observations on the dog also have been confirmed; Lommel¹⁵ found that small dogs in strange surroundings might have no movements of the stomach for two or three hours. And whenever the animals showed any indications of being uncomfortable or distressed the movements were inhibited and the discharge from the stomach checked.

Like the peristaltic waves of the stomach, the peristalsis and segmenting movements of the small intestine and the antiperistalsis of the large intestine all cease whenever the observed animal manifests signs of emotional excitement.

¹¹ The lower part of the large intestine may have an increased activity during excitement, so that there is involuntary voiding of the gut. See Darwin, *Expression of Emotions in Man and Animals*, New York, 1873, p. 77.

¹² Amer. Jour. Phys., 1898, i, 380.

¹⁴ Ibid., 1907, xviii, 356.

¹³ Amer. Jour. Phys., 1902, viii, xxii.

¹⁵ Münch. med. Woch., 1903, i, 1634.

There is no doubt that just as the secretory activity of the stomach is affected in similar fashion in man and in lower animals, so likewise gastric and intestinal peristalsis are stopped in man as they are stopped in the lower animals, by worry and anxiety and the major affective states. Indeed, the feeling of heaviness in the epigastrium commonly complained of by nervous persons may be due to the stagnation of food. That such stagnation occurs is shown by the following case: A refined and sensitive woman who had had digestive difficulties, came with her husband to Boston to be examined. They went to a hotel for the night. The next morning the woman appeared at the consultant's office an hour after having eaten a test meal. An examination of the gastric contents revealed no free acid, no digestion of the test breakfast, and the presence of a considerable amount of the supper of the previous evening. The explanation of this stasis of the food in the stomach came from the family doctor, who reported that the husband had made the visit to the city an occasion for becoming uncontrollably drunk, and that he had by his escapades given his wife a night of turbulent anxiety. The second morning, after the woman had had a good rest, the gastric contents were again examined; the proper acidity was found, and the test breakfast had been normally digested and discharged.

It is of interest to know by what paths the inhibitory impulses, which stop the movements of the stomach and intestines, pass from the central nervous system to these organs. Pflüger¹⁶ proved many years ago that stimulation of the splanchnic nerves inhibits the movements of the intestines. Pflüger's discovery has since been confirmed by many observers. There is a difference of opinion concerning the effect of sympathetic impulses on the stomach. Most investigators have attributed to these impulses inhibitory functions alone; but Morat¹⁷ has noted the opposite effect, and Openhowski¹⁸ reports that in the rabbit the sympathetic has mainly a motor influence on gastric peristalsis. May¹⁹ failed to find that stimulation of the splanchnic nerves had any effect whatever on the stomach.

Four years ago, during the course of an investigation of the motor activities of the alimentary canal after section of the splanchnic and vagus nerves, I had occasion to observe the effects of excitement on these activities after various nervous connections had been destroyed.²⁰ Under these circumstances such nerves as were left received impulses normally and delivered them normally to the peripheral organ. The conditions, therefore, were highly favor-

¹⁶ Ueber den Hemmungsnervensystem f. den peristaltischen Bewegungen der Gedärme, Berlin, 1857.

¹⁷ Arch. phys., 1893, xxv, 153.

¹⁸ Centralbl. f. Phys., 1889, iii, 4.

¹⁹ Jour. Phys., 1904, xxxi, 264.

²⁰ For a preliminary notice of these results, see Cannon, Amer. Jour. Phys., 1905, xiii, xxii.

able for determining the course of inhibitory paths. When the vagus nerves were severed and the splanchnic nerves alone remained, respiratory distress caused the usual total cessation of the movements of the stomach and small intestine. Impulses along the splanchnic nerves, therefore, inhibit not only the intestines, but the stomach as well. When the splanchnic nerves were cut and the vagi alone remained, respiratory distress had no effect on the movements of the small intestine, but if prolonged until the animal began to toss about, gastric peristaltic waves became very shallow or momentarily stopped. From this evidence it would appear that the vagi convey to the stomach not only the motor impulses generally attributed to them, but also inhibitory impulses, although these latter are not nearly so efficient in stopping gastric peristalsis as are the impulses delivered by the splanchnics. When the splanchnic and vagus nerves are all cut, it is impossible to stop the movements of the alimentary canal by respiratory distress. The stoppage in the former cases cannot, therefore, be attributed to any other agency than the nervous influence, as, for example, to asphyxia.

The foregoing exposition of the influence of emotions on the activities of the stomach and intestines has shown how profoundly the mental state may affect favorably or unfavorably the secretions of the stomach, so important for the continuation of the digestive process, and how quickly and directly the mental state may entirely check the onward movement of the food. As already noted, an emotional disturbance affecting the alimentary canal is capable of starting a vicious circle; the stagnant food, unprotected by abundant gastric juice, naturally undergoes bacterial fermentation, with the formation of gases and irritant decomposition products. These, in turn, may produce mild inflammation or be absorbed as substances disturbing to metabolism, and thus affect the mental state. And the depressed mental state that accompanies "indigestion" may still further prolong the indigestion. The importance of avoiding so far as possible the initial states of worry and anxiety, and of not permitting grief and anger and other violent emotions to prevail unduly, is not commonly understood, for the subtle changes wrought by these emotional disturbances are not brought to consciousness, and are clearly known solely through physiological studies. Only as these effects are better understood can the bad results be avoided, or, if not avoided, regarded and treated with intelligence.

The influence of emotions on digestive functions is as important a consideration for the physician as it is for the patient. On the basis of this consideration Kast²¹ has already pointed out the precautions necessary in order to make sure that the analysis of a test meal reveals the usual conditions of the patient. Announcing

²¹ *Berl. klin. Woch.*, 1906, **xlvi**, 708.

that a stomach tube is to be passed may cause serious apprehension. The tube should not be mentioned until immediately before its introduction into the œsophagus. And with easily excitable persons caution should go even farther—the meal should be eaten at home with the customary surroundings, so that no disturbing element is permitted to affect the normal processes. The necessity of taking into account the psychic state in judging the results of gastric examinations is well illustrated by the case of the woman with the riotous husband, already cited. How many cases reported as showing an acidity have had such causes acting in the background?

It would probably be an error to assume a predominant importance of the psychic state in the causation of digestive disease. The facts brought forward in this paper indicate, however, that the mental state of a person complaining of digestive difficulty may have marked effects on both the motility and the secretion of the alimentary tract. The mental state of the patient, therefore, must be considered before passing judgment on the nature of his trouble, for just as feelings of comfort and peace of mind are fundamental to normal digestion, so discomfort and mental disorder may be fundamental to disturbed digestion.

THE MEANING OF HEMATEMESIS.

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THE vomiting of blood is always a highly dramatic event. To the patient as well as to observers it is so unusual and so extraordinary an incident that it never fails to excite consternation and alarm. To the physician, on the other hand, it is not so much the occurrence itself that appeals, as the meaning of it: for he knows that some grave pathological change always lies behind this symptom, and that the discovery of what this change may be alone will determine the true significance of the episode. But the problem is never a simple one and its solution is never easy. The best that one can do in any case is to consider all the possibilities that may underlie the hematemesis; then to examine the patient in every possible way for other evidences of disease; and to try by sifting these to explain which possibility lies the nearest to probability. Absolute certainty in explanation is not possible here, as he knows best who has followed his cases most often to the operating table or to the autopsy room. What then are these possibilities of which one has to think?

I. *Cirrhosis of the liver* is the condition that probably comes first to mind when a patient vomits blood, especially if the individual

is in middle life, has a history of habitual overindulgence in alcohol, has made little or no previous complaint, and brings up a copious amount of blood without warning and without pain; and when the physical examination reveals nothing except a decreased or increased area of liver dullness and enlargement of the spleen, in addition to the secondary anemia caused by the loss of blood. A first hemorrhage of this sort is rarely fatal and, therefore, the diagnosis under such circumstances can be set down only as a reasonable probability. The following case presents the usual picture of hematemesis due to cirrhosis of the liver:

CASE I.—In December, 1905, I was called to see a man, aged forty-seven years, who suddenly began to vomit blood, and five different times during one day brought up large quantities of blood. He had always been perfectly well previously, but had taken whiskey steadily and to excess for years. He was found to have enlargement of the liver and of the spleen, but no other evidence of organic disease. He has never vomited blood since then; but has continued his abuse of alcohol, and is now suffering from morning vomiting each day and complains frequently of pain in the region of his liver.

But if the patient is not seen until months or years after the first vomiting of blood, developments probably will have occurred that enable one to attribute the hematemesis with greater confidence to cirrhosis of the liver. If there is a history of such a hemorrhage years before, followed gradually by more or less persistent morning vomiting, distress, and belching after food, irregular bowel movements, capricious appetite, and disturbed nutrition, we feel more certain about the meaning of this early hemorrhage than we could have been at the time that it took place. The following case demonstrates this fact, but shows also that even when a diagnosis appears most definite, the whole truth may not be recognized.

CASE II.—A man, aged sixty years, was first seen in May, 1908, complaining of morning vomiting for the past ten or twelve years, more or less pain and soreness over his stomach for months previous, flatulence, and belching after food. He stated that twelve years before he had vomited a large amount of blood, and again a second time three weeks after the first, but never since. For many years he had used whiskey steadily and to excess, never less than two gallons a month. His liver was found enlarged and tender, measuring 14 cm. in the nipple line; his spleen likewise was enlarged, measuring 10 cm. in the anterior axillary line. He had also a general advanced arteriosclerosis, but no evidence of disease of the heart or kidneys. During May he ran down rapidly in weight and strength, and on the 28th and 29th had profuse hemorrhage from his bowels, but at that time no blood was vomited. Following that he rapidly developed ascites. The abdomen was tapped on June 30 and one gallon of fluid removed, but it rapidly recurred. From that time on he gradually grew weaker and more exhausted until his death.

on July 22. The autopsy revealed cirrhosis of the liver, chronic splenitis, and chronic gastritis. But in addition to these, which had been diagnosed clinically, there was found a primary adenocarcinoma of the liver, with metastasis in the colon and in a lymph gland in the head of the pancreas.

The hematemesis of cirrhosis is usually early, is usually copious, and is usually followed by no further bleeding for months or years, if at all. These points are depended upon for diagnosis, but here, as elsewhere in clinical medicine, there are exceptions to the rule. The hematemesis may not occur until late in the course of the disease, may be repeated throughout several days and may thus become the direct cause of death. It has been shown by different observers that the source of the hematemesis in hepatic cirrhosis is most often a dilated vein in the lower end of the oesophagus that has ruptured from overdistention and from thinning of its wall. Usually the amount of blood poured out into the stomach from this source is so large that vomiting soon occurs from overfilling of the viscera. But if the amount discharged is small or moderate, it may not be vomited at all, but find its way out through the bowel. A history of tarry stools, long continued or frequently recurring, preceding a hematemesis, is therefore not inconsistent with a diagnosis of hepatic cirrhosis when profuse vomiting of blood finally occurs. The following case illustrates such late hematemesis, leading directly to a fatal outcome; and shows how other symptoms and the previous history may make the diagnosis of hepatic cirrhosis fairly positive, even though the vomiting of blood constitutes the last instead of the first scene in the drama.

CASE III.—A man, aged sixty-four years, entered the Lane Hospital in August, 1908, complaining of vomiting of blood. He had been a saloon keeper for twenty years, and during that time had habitually taken at least three or four drinks of whiskey every day. About a year before he came under my observation he had noticed that his skin became yellow and his stools became black. In January, 1908, he entered another hospital and remained for two months. The jaundice then disappeared for a time, but recurred after he returned home. The stools had remained persistently black and tarry for months. His appetite had been poor, and his food caused indigestion and flatulence, but he did not vomit and had no pain. On August 14, while lying quietly in bed, he suddenly vomited about a quart of dark, clotted blood. This was repeated on the 17th and the 19th, but in smaller amounts. On the 20th and 21st, while in the hospital, he again vomited blood repeatedly and profusely until his death at noon on the latter date. The prominent physical signs were those of decided jaundice, with contracted liver, enlarged spleen, general arteriosclerosis, but no ascites or oedema. The autopsy showed atrophic cirrhosis of the liver, chronic splenitis and peri-splenitis, and a ruptured varix in the lower part of the oesophagus.

II. *Gastric ulcer* is usually looked upon as a frequent cause of hematemesis, if not the most frequent. But in my own experience it has not been so, nor, on the other hand, has hematemesis been found a common symptom of gastric ulcer. In 1907 I reported 4 late cases of gastric ulcer in which the diagnosis had been positively demonstrated by operation or by autopsy, in only one of which had there ever been any hematemesis. In by far the largest group of cases coming under my observation the diagnosis of gastric ulcer has been made without this symptom of vomiting blood, while in a number of other cases in which it has occurred and has been depended upon as diagnostic, no gastric ulcer has been found at operation or at autopsy. When hematemesis presents itself, the typical history that speaks for gastric ulcer as a cause is as follows: The patient is usually under middle age; has been suffering for months or years from acid dyspepsia, varying in severity at different times; pain has been a prominent symptom throughout; and the vomiting of blood comes late, after a long-continued period of ill-health. A most characteristic case is the one reported in the group to which I have previously referred.

CASE IV.—A man, aged thirty-eight years, was first seen in August, 1901, complaining of pain in his stomach and vomiting. He had had recurring attacks of stomach trouble similar to this for some years before. His symptoms in detail were pain after food, always worse at night, felt below the border of the ribs on the right side and running through to the back; vomiting occurring at the height of pain and relieving it, the vomited material being very sour, and irritating; much belching and flatulence, tenderness over the epigastrium, and obstinate constipation. He had a persistent hyperchlorhydria, his total acidity varying from 71 to 100 and the free HCl running as high at times as 70. His symptoms all disappeared under treatment in 1901, but all recurred in 1902, with the addition of a sudden profuse hematemesis in August of that year. This vomiting of blood was repeated at intervals of a few days and finally every day until his death on August 28. The autopsy showed an oval ulcer, 2 by 3 cm., lying across the pylorus, one-third in the stomach and two-thirds in the duodenum, with a large branch of the arteria gastroduodenalis lying open in its floor.

But if in a doubtful case the history of which resembles that of gastric ulcer the vomiting of blood be given too much importance in weighing the evidence, errors in diagnosis are likely to arise. In the following case, for instance, the hematemesis was looked upon as the deciding bit of proof that turned the scales.

CASE V.—A woman, aged forty-six years, seen in February, 1908, said that for years previous she had been subject to attacks of indigestion, from which she could obtain relief only by taking large doses of bicarbonate of sodium. These attacks had gradually grown more frequent and more severe. They were characterized by pain

running through from the stomach to the back; vomiting at the height of the pain, which usually gave relief; and at times pain even in the empty stomach, with vomiting of sour fluid. She had three different times vomited blood—once profusely four or five years before; once in April, 1906, following the great fire; and a third time only a day or two before I saw her first. For a week before this last occasion the pain had been unusually severe, with persistent vomiting which gave no relief. She was a very large, obese woman, weighing 218 pounds. The abdominal wall was so thick that satisfactory palpation could not be made, but there was extreme tenderness in the epigastrium and the right hypochondrium. A test meal could not be retained, and therefore no analysis of the gastric contents was made; but from the history and physical examination, the ease was looked upon as one of gastric ulcer. Operation by Dr. Emmet Rixford, on February 25, showed, however, that there was no ulcer present. What was found was a greatly distended gall-bladder, containing an abundance of viscid bile and numerous stones, with occlusion of the cystic duct by stones. Since then she has again had several attacks like the old ones, with pain through from the epigastrium to the back, and vomiting of sour, burning material, but never any further vomiting of blood. She undoubtedly has a hyperchlorhydria, but she has no gastric ulcer. The vomiting of blood is unexplained.

The bleeding from a gastric ulcer that leads to hematemesis is usually from a good-sized vessel opened in its base; a considerable amount of blood is poured out quickly, so that vomiting of bright red blood occurs: it is not retained in the stomach long enough to be altered by the acid secretions. But this is not always the case. Smaller vessels may be eroded and the hematemesis may be much less in amount and of dark purple or brownish material instead of bright red blood. In such cases of ulcer, however, the blood is much less likely to be vomited, but rather to pass out into the bowel where it can be detected either by gross inspection or by more delicate tests of the feces. While frequent vomiting of small amounts of altered blood may therefore mean gastric ulcer, especially when associated with a typical ulcer history, it is more likely to mean something else. The following ease shows how easy it is to misconstrue symptoms and signs that are usually considered diagnostic.

CASE VI.—A woman, aged seventy years, was first seen at Lane Hospital in August, 1908, during the act of vomiting a few ounces of dark brownish material that tests proved to consist of altered blood. She said that for twenty-five years previous she had had repeated attacks characterized by nausea, burning in the stomach, vomiting and retching, and especially the vomiting of "black stuff." Such attacks had lasted several days or a week. At first they occurred not more than once a year; but gradually they had grown more frequent until now they were almost constant. During the

previous six weeks she had suffered from attacks of vomiting as often as every three or four days, always bringing up "black stuff" and brownish material resembling blood. Food always caused much burning and distress. The patient was a very obese woman, with such an enormous layer of fat over the abdomen that no exact palpation could be made; but she complained of great tenderness in the right hypochondrium on pressure. The test meal showed nothing except a moderate hyperchlorhydria. The case was considered one of chronic gastric ulcer. But the operation by Dr. Rixford on August 8 showed no ulcer present in any part of the stomach. The gall-bladder and ducts were all normal. The only explanation found for the repeated hematemesis was a shrunken, granular, and hardened liver.

It seems clear, therefore, that a profuse hematemesis is to be looked upon as a late complication of long-standing, gastric ulcer, and is never to be awaited before a positive diagnosis is made. The vomiting of small amounts, frequently repeated, of altered blood may mean gastric ulcer, but is always to be looked upon with suspicion as a diagnostic sign, even though a typical ulcer history co-exists. Bleeding from gastric ulcer is common, but vomiting of blood is not. Tarry stools or occult blood in the feces are much more frequently found.

III. *Gastric cancer* is the condition that above all others gives rise to the small, frequently repeated hematemesis, the blood being dark, altered by gastric juice, forming the classical, "coffee-ground" vomitus. The free abundant hemorrhage of cirrhosis or of ulcer is very rare in cancer, though it may occur. With the hematemesis, too, there is a very different history in cancer: of rather sudden onset of gastric symptoms and no lengthy period of indigestion preceding for months or years; of progressive disturbance of strength and nutrition; of loss of appetite, distress soon after food is taken; of belching and persistent vomiting of food long before there is any vomiting of blood. Hematemesis does not occur early and not until ulceration of the newgrowth has taken place; by which time there is commonly a palpable tumor present and absence of free HCl after a test meal. All of these collateral symptoms and signs usually make it easy to decide when hematemesis means cancer of the stomach. But there is one extremely misleading exception, and that is the cancer that originates upon an ulcer base. That this happens not infrequently is gradually coming to be recognized. The following case shows how, under such circumstances, hematemesis of the ulcer type, with characteristic ulcer history and stomach analysis, may nevertheless be a symptom of gastric cancer.

CASE VII.—A man, aged forty-two years, was first seen in November, 1906, complaining of pain in his stomach coming on about two hours after eating, and relieved usually by taking food and always by taking bicarbonate of sodium; also of sour water coming up in his

throat when pain was severe, and of obstinate constipation. He had epigastric tenderness and a succussion splash, and a test meal showed hyperacidity. Under treatment for these symptoms he lost them all temporarily. But he returned for advice in March, 1907, with a recurrence of all the old trouble, and the addition of frequent vomiting of sour water and a history of progressive loss in weight. He again had a marked succussion splash, resistance and rigidity and tenderness in the right hypochondrium, and after the Ewald test meal a total acidity of 50, with the HCl 40. The symptoms did not improve this time under treatment. In April, 1907, he had a very severe attack characterized by much pain and constant vomiting and the vomiting of considerable blood. His test meal now showed a total acidity of 60, with the free HCl 32. He was then put to bed on a rigid treatment for gastric ulcer, but even so continued to vomit quantities of dark, chocolate-colored fluid that tests showed to be altered blood. This happened throughout several days and then ceased. By the end of May he was again up and about but still had pain and vomited at times and had grown very thin, having lost 40 pounds in weight. Still he had no palpable tumor in his abdomen. As his trouble continued during the summer, in spite of lavage and careful dieting, it was finally concluded by several who saw him in consultation that he must be operated upon for dilatation of the stomach caused by a stenosed pylorus from gastric ulcer. This was done in November, 1907, and a carcinoma was found at the pylorus with extensive metastases in the liver, prohibiting any attempt at extirpation. He died a few weeks later.

IV. Splenic Anemia. When once we leave the three great causes of hematemesis heretofore mentioned, all the others become unusual and infrequent by comparison. Yet there are several other important conditions that may cause blood to be vomited, and of these splenic anemia is not so very rare. Its diagnostic features are the following: (1) Splenic enlargement; (2) anemia of the chlorotic type, with leukopenia; (3) hemorrhages from the stomach; and (4) terminal ascites with hepatic cirrhosis. The hematemesis may be the first symptom to excite alarm and to cause the patient to seek advice; when the greatly enlarged spleen and the blood count give the clue as to the nature of the disease. The splenic enlargement is usually greater than in hepatic cirrhosis, the anemia has certain peculiar characteristics, and the history is one of weariness, weakness, and dyspnoea, rather than of gastric or intestinal disturbances. The following case of hematemesis seemed to be due to splenic anemia, though it was lost from observation before the opportunity for autopsy arrived, which alone could have made the diagnosis positive.

CASE VIII.—A woman, aged thirty-eight years, consulted me in September, 1905, because she had been told she had cancer of

the stomach. The reason for this diagnosis was the vomiting of a quantity of bright red blood on five different occasions during one week, shortly before I saw her. But she had no other vomiting or gastric distress at any time before or afterward. Her principal complaint was of exhaustion, weakness, and shortness of breath, which symptoms had been present for months before the hemorrhages occurred. She was not at all emaciated, but extremely pale. The spleen was enlarged so that it extended 5 cm. below the border of the ribs. It was hard in consistence and tender on palpation. The liver dulness measured 12 cm. in the mammary line. There was no evidence of disease in the heart, lungs, or kidneys. Her blood counts (made for me by Dr. H. R. Oliver) were as follows: September 14, 1905; reds, 2,500,000; whites, 4800; hemoglobin, 20 per cent.; October 7: reds, 3,000,000; whites, 6000; hemoglobin, 75 per cent. While under observation she developed a moderate ascites and became so weak that she had to go to the hospital; but with rest in bed and arsenic she improved greatly. After leaving the hospital the subsequent history could never be traced.

Hematemesis likewise occurs with other diseases of the blood, such as pernicious anemia and the leukemias; but the blood examination is usually sufficient here to explain the situation. Purpura haemorrhagica also belongs in the same group as a possible cause of vomiting of blood; but here there are other hemorrhages besides that from the stomach, into other mucous membranes as well as into the subcutaneous tissues. In all these conditions the problem is never simple, and before reaching a conclusion one must go carefully into the history preceding the hematemesis, as well as into the physical examination other than investigation of the blood itself.

V. Acute Pancreatitis. That hematemesis can form a very important symptom of acute pancreatitis has recently been called to my attention by the following case:

CASE IX.—A man, aged twenty-nine years, always previously well, was taken suddenly and violently ill on the evening of July 19, 1908. After his supper he had a feeling of weight in his stomach rapidly increasing to violent pain. This persisted until, one hour later, he vomited a large amount of "black-looking stuff;" this happened twice during the night, and he estimated there must have been a gallon of it altogether. Pain then ceased. During the next few days he had a moderate amount of pain at intervals; persistent nausea and vomiting, irrespective of food; obstinate hiccup, only relieved temporarily by stomach washing; a good deal of bloating and distention in the upper abdomen; but no fever of consequence. After July 25 there was no further hiccup or pain, but he continued to vomit, at least once every day, even though he was fed exclusively by the rectum. The vomitus consisted of thin material, dark brown in color. He was brought to my service at Lane Hospital on July 31 from his home in the country, when

The remedy used in all the cases of disease in man has been this aqueous extract of rabbit leukocytes, although a similar preparation from other animals (dog) was also used in laboratory work. In most cases the leukocyte extract was made from normal rabbits, but in a few cases, prior to the injection of the aleuronat, the rabbits were immunized to the bacterial cause of the disease to be treated. With this occasional exception the same remedy was applied to all the infectious diseases treated irrespective of the causative agent, for the effect of the remedy is on the toxins of the bacteria and not on the bacteria themselves. The effect is to neutralize the toxins and to assist this action of the patients' leukocytes which can meanwhile be increasingly busy in their phagocytic action. The patient is thus protected against the bacterial poisons pending his own action to destroy the bacterial cause of the disease. The fundamental nature of Professor Hiss' work from the therapeutic view point is found in this one fact that a single antitoxic animal product can influence the toxemia of a number of bacterial causes of disease.

This new method of therapy has been tried in my wards in cases of meningitis, pneumonia, ulcerative endocarditis, and malaria, and in other services in cases of chronic furunculosis, acute erysipelas, and other forms of septicemia. It has been found to influence the course of most of these diseases in a marked manner, but in varying degrees in different diseases and in different cases of the same disease. It is not a cure-all, but it offers a new help in antibacterial medication which is applicable to any case prior to the establishing of an exact bacterial diagnosis. Before giving the details of the results in individual cases I would state that this remedial method has been subjected to the severest clinical test that was possible. Those patients who presented a type of disease with evident mild infection and with symptoms indicating a good prognosis were, as a rule, not treated with these leukocyte extracts. But these injections were given in large degree to the patients who were evidently severely ill. The results are to be judged from the study of the symptomatology and the daily course of the cases, fully as much as from the mortality statistics of the cases treated. In fact, the number of cases treated is as yet too small from which to draw any final conclusions whatever.

Four cases of epidemic meningitis occurred in my service while this method of treatment was in use. They have already been included in Dr. Hiss' publication and statistics on this disease. Of these cases, three recovered and one died.

CASE I.—A girl, aged nine years, was admitted on the second day of the disease, after a sudden onset with vomiting, chill, fever, headache, stiff neck, and delirium. The temperature was 103.4°, the pulse 160, and the respirations 32. The leukocytes were 30,600 (polynuclears, 88 per cent.); and meningoeocci were present in the

spinal fluid. Ten e.c. of leukocyte extract was given on the day of admission and thereafter each day or at two-day intervals until twelve injections had been given. The patient improved and was discharged cured on the forty-ninth day.

CASE II.—A girl, aged eleven years, was admitted on the third day of the disease, with a history of headache, vomiting, delirium, and stiff neck. The temperature was 101°, the pulse 100, and the respirations 20. The leukocytes were 29,000 (polynuclears, 91 per cent.); meningococci were present in the spinal fluid. The case was under observation for twenty days, with gradual failure in the general condition and an irregular temperature. On the twentieth day of the disease treatment was begun with an injection of 10 e.c. This injection was repeated on the twenty-first day and again on the twenty-third day. The temperature remained normal after the second injection and the child gradually improved, and was discharged cured after thirty-six days of hospital care.

CASE III.—An infant, aged seven months, was admitted with a history of ten weeks of illness and fever. Two days before admission vomiting and convulsions occurred and had been repeated. On admission the temperature was 103.6°, the pulse 126, and the respirations 40. The neck was rigid and the spinal fluid contained meningococci. The child's temperature became normal, but she continued emaciating, with extreme stiffness of the neck and extremities and constant vomiting. The first injection, made on the forty-seventh day of the disease, was of 10 e.c.; the injection was repeated daily, or every other day, usually in doses of 5 e.c., until a total of 50 c.c. was given. The general condition improved, the child began to take food, gained weight, and was finally discharged cured on the one hundred and thirty-eighth day.

CASE IV.—An adult, aged twenty-five years, was admitted on the second day of the disease, complaining of headache, general pains, and vomiting. The temperature was 99.2°, the pulse 92, and the respirations 22. There was a general hemorrhagic eruption, the patient had a rigid neck; and meningococci were found in the spinal fluid. The leukocytes were 21,000 (polynuclears, 93 per cent.). The patient died on the thirteenth day of the disease in spite of daily injections of 10 c.c., and there was no evidence of improvement while taking the treatment.

The treatment was tried in one case of pneumonia which ended fatally, and which was proved by autopsy cultures to be due to Friedländer's bacillus. The case showed a distinct increase in the number of leukocytes after each injection and some drop in the temperature curve, but the toxemia was extreme and there was no permanent change in the course of the disease or in the severity of the infection.

An equally severe test was that of an elderly woman, aged eighty-four years, who developed a sudden illness with cough, fever,

cyanosis, and dyspnoea. On the third day there was an evident consolidation in the right upper lobe, the temperature was 103°, the pulse feeble, the patient was quite cyanosed on coughing, and a fatal termination seemed inevitable. Three injections of 10 c.c. of the extract were made on three successive days. The patient improved at once after the first, and the second was followed by a fall in the temperature to normal, where it remained and the patient recovered. In this case no bacterial diagnosis was attempted.

Professor Hiss reported some 8 cases of lobar pneumonia which were treated and all of which recovered. But there was no remarkably striking result and no change in the ordinary length of the disease. A systematic study of a large number of cases of pneumonia has not been undertaken.

The treatment has been tried in a number of cases of a more general infection with the pneumococcus. These have included cases of cerebrospinal meningitis and of ulcerative endocarditis of pneumococcal etiology. The cases of pneumococcal meningitis showed distinct febrile remissions after the injections, but neither of two cases recovered, nor did any evidences of a real betterment in general condition appear.

The three cases of ulcerative endocarditis which have been treated by this method have not proved particularly amenable to the injections. Two cases were due to the pneumococcus which was recovered from the blood. In the third no living organism could be demonstrated by culture from the blood. In one case the temperature before the injection ranged from 101° to 103°. After the injection of 130 c.c. of the extract in thirteen doses the temperature ranged for a few days between 100° and 102° upon a slightly lower plane. At this stage of the disease the patient developed a consolidation of the left lung and died with all the evidences of cerebral embolus and paralysis of the left side of the body. In the case of negative blood culture the injections did not seem to be of any influence either on the course of the fever curve or on the final result. The patient died of cardiac depression shortly after the treatment was given.

The third case was that of a man, aged forty-seven years, who had been ill four months with gradually increasing weakness and chills at irregular intervals during that time. He suffered from evidences of cardiac disturbance: palpitation of the heart, shortness of breath, and dizzy feelings. During these four months he lost forty-five pounds, had night sweats, and suffered from sleeplessness. He was admitted with a temperature of 101°, a pulse of 88, and respirations 24. His leukocytes were 11,900 (polynuclears, 81 per cent.). Examination of his heart showed a systolic murmur loudest over the pulmonary area and heard over the whole left half of the pectoral area. He had petechial spots on his legs and right forearm and in his conjunctiva. A blood culture gave a pneu-

mococeus of lowered virulence but in pure culture. The course of the disease for five days was about the same on each, the pulse ranged from 90 to 100, the temperature from 101° to 103°, and the patient's condition seemed stationary. Leukocyte extracts were begun after six days of observation. These were given daily, sometimes twice daily, and once three times from the seventh day of observation until the seventeenth. During this time his temperature would vary from 100° in the morning to 102° or 103° in the afternoon. The patient in this period received 220 c.c. of extract of leukocytes from normal rabbits, 40 c.c. of leukocyte extract from rabbits immunized against the patient's own brand of pneumococcus, and 18 c.c. of a true antitoxic serum from pneumococcus-immunized rabbits. The leukocytes increased up to 13,000 and the polymuclear cells remained about 86 per cent. His hemoglobin on admission was 65, and at the end of this time had fallen to 45 per cent. His red cells had fallen from 4,800,000 to 3,800,000. The patient developed after this course of treatment an urticaria, and treatment was suspended for three weeks. No special change was noted during this time in the patient's condition. The temperature ranged irregularly, the pulse became rather rapid, ranging from 120 to 140, the patient developed emboli in the right lung, giving rise to several small infarcts, and his condition was distinctly downhill. After being in the hospital for five weeks his leukocytes were 17,800, his polymuclears 81 per cent., his red blood cells 3,800,000, and his hemoglobin 40 per cent. It could be said that the leukocyte extracts had modified his disease in any particular. At this point the injections were resumed and the course of the ease showed some slight changes in the run of the temperature. For a short period the remissions were greater, the pulse rate was somewhat slower, and the patient seemed less ill. A second blood culture taken at this time showed the same positive cultural result as before, and the patient grew slowly worse. He developed a general petechial eruption, evidences of extensive infarctions appeared in his lungs, and he died of his toxemia.

Of all the infectious diseases, acute ulcerative endocarditis must be looked upon as the most difficult to modify by treatment. It has necessarily been considered a fatal disease, and will always be considered as the supreme test of any remedy which is suggested.

The influence of leukocyte extracts on febrile disease was perhaps most markedly shown in a case of tertian malaria. The patient was an adult, aged thirty years, and was admitted with a history of having had severe chills, at first every other day, and later daily. The patient had been taking quinine irregularly for six months. A physical examination showed an enlarged spleen one and one-half inches below the ribs. Her other organs appeared normal. The admission temperature was 98.4°, but upon the afternoon of the day of admission the patient had a chill and a rise of temperature

to 104°, which rapidly fell until, the next morning, it was 97°. A second chill with a rise of temperature to 106° followed on the second afternoon. Plasmodia of the tertian variety were present in large numbers in the blood. White blood cells ranged from 5400 to 7000, and there was a relative lymphocytosis. Immediately following this second chill the patient received 10 e.e. of leukocyte extract. This was repeated twice on the day following and once on the day after that; the patient's temperature on the third day of observation was 98.4° in the morning, 100.8° in the afternoon. On the fourth day it was 99.2° in the morning and 102.2° in the afternoon. On the fifth day it was 98.4° in the morning and 102.4° in the afternoon. On the sixth day it was 98.8° in the morning and 103.8° in the afternoon.

During all this time there was no treatment; the plasmodia continued, on daily search, to be present in the blood in large numbers. There were no chills and the patient felt perfectly well, except for the tenderness over the points of injection. The next day she received another dose of leukocyte extract of 10 e.e. Her morning temperature was 98.4°, her evening temperature 100.4°. The next day her morning temperature was 98.4°, her evening temperature 103°. She received a sixth dose of the serum. On the next day her temperature ranged from 98.4° to 100.8°. The day following it was 98.4° in the morning and 103° in the evening; the next day the same, 98.4° and 103°, with plasmodia present. The day following, the patient had a chill, the temperature rose to 104.4°, and the day following this was repeated, the temperature rising in the afternoon to 104°. The patient became restive under the treatment, she was given quinine, 5 grains every four hours, and her temperature did not rise again. The interesting feature in this case is the absolute control for short periods of time of the toxic symptoms in a case of double tertian malaria by an injection of leukocyte extracts. The disease returned rapidly, however, and went on its usual course until cured by quinine. Two further cases of malaria have been treated, but the results did not tally with the above. It was not possible to check the course of the chills in either one.

The effect on typhoid fever has not been carefully tested. It is evident, however, from a few experimental injections that these leukocyte extracts alone will not modify the course of that disease, and further experiments are necessary. The laboratory indications are favorable to the hope that some modification may develop a proper method of procedure in typhoid cases, but the characteristic polymorphonuclear leukopenia of typhoid fever may explain the absence of effect on the toxemia of the disease.

The most brilliant result of this treatment was found in the group of the pyogenic cocci. The treatment of local lesions of the skin was attended with striking results in a series of six cases of recurring

boils in the course of a chronic furunculosis. The cessation of the eruption promptly in all of the six cases treated was an index of the curative effect. All six cases were infections with *Staphylococcus aureus*, and two had been of several years' duration. Two other cases of chronic acne without pustule formation showed distinct improvement in the local lesion from a short course of treatment.

Perhaps the most remarkable results were obtained in a series of cases of erysipelas.² The following two cases show two types of the effect from the leukocyte extracts: In one the treatment was begun on the tenth day in a very toxic man and was continued by injections on four out of five days. Each treatment was followed by a fall in temperature, by an improvement in the patient's comfort, and by a normal fever curve after five days. The second case came under treatment on the second day of the disease with a temperature of 105° and a typical erysipelas of both eye regions, cheeks, forehead, and one ear. The eruption had some blebs and a red raised border. After one injection the temperature fell to normal, but the rash extended and a second injection completed the cure.

The following case of otitis media, complicated by mastoiditis and thrombosis of the jugular vein, was treated by the leukocyte extract, beginning after ten days of severe septicemia. The patient, a woman, married, aged thirty-one years, was admitted to the Manhattan Eye and Ear Hospital, on November 12, suffering from otitis media; puncture of the left ear drum was followed by a profuse purulent discharge. There was tenderness over the mastoid on admission. On November 14 a simple mastoideectomy was done, and at the operation a small area of sinus but no dura was exposed. November 15, the patient complained of pain in the right ear; the temperature was 102°. The membrane was bulging and was punctured; a purulent discharge followed. During the next four days the temperature ran a septic course, wavering between 105° and 101°. On November 17 the face was swollen, with marked redness. On November 18 oedema of scalp developed on the left side. On November 21 an exploration of the sinus showed it to be collapsed and the jugular vein thrombosed. A resection of the jugular vein was done. The temperature was running a septic course between 104° and 100°; 10 c.c. of leukocyte extract was injected on the 22d and the 23d. The temperature gradually came down, and did not rise above 102° on November 24 and 25. In the evening of November 25 the temperature again rose to 104°. The physician in charge omitted the treatment with the extract, thinking the case hopeless, but the patient nevertheless held her own for several days, and 20 c.c. of leukocyte extract was injected on November 28. A gradual

² These cases will be reported by A. V. S. Lambert in the immediate future.

improvement followed and the temperature became normal by December 3, where it remained, and the patient recovered.

The theoretical basis of this method of treatment was conceived by Professor Hiss upon the following argument: Contrary to the assumption of Wright that the phagocytic power of the leukocytes depends entirely upon the opsonins in the serum, Hiss observed that the phagocytic power of the white blood corpuscles varied in normal and in infected animals independently of the opsonic contents of the serum and in such a way that it was probable that this phagocytic power was depressed during the early stages of an infection and up to the height of its development and was increased as immunity became established and a cure resulted. Upon this basic observation as a premise Hiss inferred that in some diseases immunity depends upon the activities of the purely cellular elements of the blood independently of the serum. It is a fact also that animals survive repeated larger doses of germs because they develop, under the stimulus of repeated infections, both an increasing power of serum (antitoxins) and an increasing power of phagocytosis, and in addition an increasing power of neutralizing toxins. He inferred that some of this increasing power to neutralize toxins is an intracellular neutralization of the toxins set free from dead bacteria within the phagocyte cells quite independently of the antitoxic bodies of the blood plasma, which are known as antitoxins, agglutinins, precipitins, bacteriolysins, etc. He inferred then that there exists a kind of immune agents which are distinct from those of the plasma and which remain in the cells for cell protection alone, and are only seldom given off into the plasma. He inferred that these intracellular neutralizing bodies act upon the poisons liberated from the germs after these bacteria have died in the processes of phagocytic digestion. Such poisons are known as endotoxins, and Professor Hiss would name his theoretical neutralizing bodies of the leukocytes as "endo-antitoxins."

On these theoretical grounds Professor Hiss has established this method of therapy by which he hopes to aid the leukocytes in their combat with the bacteria by adding to the blood plasma the very substances which they elaborate and employ in the struggle. Professor Hiss would direct the method against those endotoxin-forming microorganisms against which no immune sera in the ordinary sense have been found to be efficient. This theory of the existence of an immunity due to non-diffusible endo-antitoxins formed and retained within the leukocytes must cause one to modify a semi-popular idea of the white blood cell as the warlike fighter of the animal economy, and must lead to a new conception in pathological cellular biology that the leukocyte is not an altruistic cell rushing to its death for the good of the greatest number, but it is a selfish protector of its individual existence which continues to live as an individual and as a "species" upon the broad laws of natural selection and of the survival of the fittest.

The diseases caused by infection with the various pyogenic cocci, both staphylococcus and streptococcus, are all diseases whose symptoms depend, in part at least, upon endotoxins. The same is true of typhoid fever, of epidemic meningitis, and of pneumonia. The chief diseases with soluble toxins which have come under observation in man are tetanus and diphtheria, and in these only can we hope to establish a true antitoxic serum. The attempt to form a polyvalent serum for the endotoxin diseases has also not been universally successful. And in general it has not been possible to secure a serum against the individual germ of any given case, because of the time required for the immunization of an animal. It would seem, therefore, that the theories of Professor Hiss have opened up a new field for antibacterial therapy which should be searched for new applications and subjected to an extended study. Professor Hiss has used in most of his experiments leukocyte extracts from normal rabbits, but in a few cases he has endeavored to produce an immunity against the general group bacteria which he is fighting, and to use leukocyte extracts from these partially immunized rabbits. In a few cases running a chronic course he first endeavored to immunize the animals against the germ secured by blood culture or otherwise from the patients before manufacturing the leukocyte extract from those animals. This has been attempted, for instance, in the case of ulcerative endocarditis cited above, but, as has already been shown, the endocarditic cases, as might be inferred a priori, have been particularly resistant to both kinds of extracts.

The result of the animal experimentation which Dr. Hiss carried on showed that the leukocyte extracts from normal rabbits could protect rabbits infected with lethal infections of various bacteria. Extensive experiments have been made on *Staphylococcus aureus*, on *pneumococcus*, on *streptococcus*, on *meningococcus*, and on typhoid bacilli. In all cases the effect was greater the earlier the beginning of the treatment. The same leukocyte extracts from normal rabbits cured guinea-pigs of infections universally fatal in control animals, so that the change in the species of the animal from that of the source of the leukocyte extract did not change the results of the experiments. So far as any inference could be drawn from the use of leukocyte extracts from immunized rabbits, it was found that this product had greater power than the extracts from normal animals. In the animals treated with leukocyte extracts it was found that the growth of bacteria was not directly inhibited by the treatment, nor was there evidence of an increased phagocytosis. The remedy, therefore, is neither bactericidal nor bacteriolytic, nor is it stimulating to the phagocytes. Its use in animals is usually followed by an increase in the polymorphonuclear leukocytes, and it seems justifiable to infer that its action has to do entirely with the neutralization of the bacterial endotoxins.

The following general conclusions seem to be justified: We have a new remedy representing a new point of view in the study of immunity, proving an endoellular immunity in addition to the accepted types of serum immunity and of phagocytosis. This remedy is applicable to obscure cases of unknown bacterial cause, to cases of disease with unknown or unapproachable lesions. The remedy influences the toxemia of the disease and gives an opportunity to the body cells to overcome the infection by removing from them the necessity of immediately attacking the endotoxins of the bacteria. It is by no means a "cure-all." It does not cure every case and it produces no miracles. It will not remove death from the world. In application it is painful locally, but it has caused no other local complication, and the urticaria so often seen in the use of serum has been conspicuous by its absence.

Finally, I would apologize for rushing forward with such a new and unproved theory of therapeutics, except that it seems justifiable to make known the fact that a new discovery is ready to be put on trial and to be thoroughly tested by many observers. Whatever is good in it will last, and whatever cannot stand this test of modern universal investigation cannot be worthy to endure.

THE RÖNTGEN-RAYS IN THE TREATMENT OF DEEP-SEATED MALIGNANT DISEASE.

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As the title indicates, the epitheliomas or superficial carcinomas will be omitted from consideration in this paper. The superiority, though not infallibility, of this therapeutic agent, I think, is well recognized in the treatment of superficial carcinomas. Its value in the treatment of deep-seated malignant disease is not so well recognized. By a few persons it is declared useless, while by others it is lauded as a cure. It is the object of this paper to arouse a discussion which will determine, as nearly as possible, its true status. The arguments which I present are based almost entirely upon personal observations made in the treatment of 35 sarcomas and 304 deep-seated carcinomas.

I have classed as deep-seated those cases in which the subcutaneous, glandular, viscerai, or osseous tissues were involved. For the most part, the cases were recurrent, very advanced, or very malignant. As a whole, the cases are those that have passed beyond the reach of other forms of treatment. Therefore the Röntgen-rays

were used as a last resort, and while there has been ultimate failure in the majority of cases, some lives have been saved or much prolonged, and in nearly all there was some temporary benefit.

SARCOMA. At the annual meeting of the American Röntgen-ray Society, October 26, 27, 28, 1907, I presented a review of the work done by myself and others in the treatment of sarcoma by means of the Röntgen-rays¹. At that time I reported details of 22 cases treated by myself. Of these 22 cases, 11 had recovered and 4 more were recovering. On May 7, 1908, I reported at a meeting of the American Therapeutic Society the subsequent results in these cases, and added details of seven other cases.²

The cases of sarcoma that have come under my care have consisted almost entirely of those that were beyond any other form of relief, and therefore the recoveries are pure gains and just so many lives saved or prolonged. They were nearly all inoperable or recurrent, and the only other treatment that could be considered is the use of Coley's toxins of the streptococcus and *Bacillus prodigiosus*. Coley has obtained good results in 10 per cent. of his cases. My results show recoveries in over 50 per cent. of the cases. Fortunately there seems to be no reasonable objection to combining the toxins with the Röntgen-rays in the treatment of these inoperable cases of sarcoma. This I have done in four cases, but am not yet able to draw any definite conclusions. I believe that much skill is required in the use of the toxins. All acknowledge that much skill is required in the use of the Röntgen-rays.

Permanency of Results. The results cannot be properly appreciated unless the details of the cases are considered. I shall review in as few words as possible the results in 35 cases. In each case in which the type of cell is mentioned, and when not otherwise designated, the pathological examination was made by the surgical pathologist of the Medico-Chirurgical Hospital, under the direction of Professor Joseph McFarland.

CASE I.—A sixteen-year-old girl, referred by Dr. L. W. Fox, December 5, 1903, developed a small round-cell sarcoma involving the left orbit. At the beginning of treatment she was not expected to live a month. She recovered after three months treatment without damage to the eye. She remained well four months, when, following a slight operation upon the nose, she developed a rapid and an extensive recurrence and died.

CASE II.—A young man, aged twenty-one years, referred by Dr. W. L. Rodman, December 11, 1905, had developed a round-cell sarcoma at the angle of the jaw which grew to the size of an apple in four weeks' time, and was then excised. It recurred to the same size in four weeks, and was again excised. On the fifth day after

¹ New York Med. Jour., December 21, 1907.

² Therapeutic Gazette, July 15, 1908.

the second operation it had again recurred to half the size of a hen's egg, when he was referred to me for treatment. He was given twenty-two treatments in five weeks. Since then he has had no treatment, and is still well nearly three years later.

CASE III.—A young lady, aged thirty years, referred by Dr. E. B. Gleason, September 5, 1904, had developed a round-cell sarcoma involving the frontal, ethmoid, and maxillary sinuses. A section had been removed and examined by the pathologist of the Chester Hospital. She has been given to date 416 treatments. She has lived and has been quite comfortable for four years. She returned to her occupation as a milliner two months after beginning the treatment, and has continued to the present time. The tumor, as shown by a series of röntgenograms made at intervals, has nearly disappeared.

CASE IV.—A young girl, aged eleven years, was referred by Dr. Wm. L. Rodman. She had a small round-cell sarcoma involving the frontal and ethmoid cells. She was given thirty-one treatments between January 29 and April 18, 1907. Since then, a year and one-half, she has remained well.

CASE V.—Mrs. E. P., aged thirty years, was referred by Dr. W. W. Babcock, November, 1906. She had undergone three operations upon the right forearm for round-cell sarcoma and recurrences. After thirty-two treatments in five months she recovered, and has remained well to date, which is approximately a year and one-half.

CASE VI.—A man, aged thirty years, was referred by Dr. W. W. Babcock, November 13, 1906. He had a recurrence following the second operation for sarcoma of the region of the right shoulder blade. This recurrence was as large as his head. Two months of daily Röntgen treatment caused a degeneration of the tumor, which was then cleaned away with the fingers. The degenerated material weighed eleven pounds. After this he gained twenty pounds in weight. A portion of the tumor in the anterior axilla which had not been treated actively grew rapidly seven months after beginning treatment and caused his death.

CASE VII.—Mrs. M. M., aged sixty years, was referred by Dr. W. L. Rodman, April 26, 1904. She had been operated upon four times for round-cell sarcoma growing from beneath the right ear. The fourth recurrence was treated by the Röntgen-rays during the first six months of 1904. She is still well four years later.

CASE VIII.—Miss L. B., aged eighteen years, was referred by Dr. M. P. Warmuth, March 5, 1906. Following a bruise, a small round-cell sarcoma developed, involving the upper four inches of the fibula. After forty-seven treatments in three months she was symptomatically well, and has remained well over two years.

CASE IX.—Mr. F. B., aged fifteen years, was referred by Dr. W. L. Rodman, October 29, 1902, and was treated for recurrent osteosarcoma involving the right upper maxilla. He was given

sixty treatments in eight months, and has remained well five years and three months.

CASE X.—Mr. M. L. M., aged forty-six years, was referred by Dr. E. Laplace, August 17, 1905. His right leg and the finger of one hand had been previously amputated for osteosarcoma. A recurrence was present in the hand. After six months' treatment with the rays there was little change in the size of the tumor, and he asked for an amputation of the hand. He has remained well two years and one-half. Since then I have learned that little reduction takes place in the size of an osteosarcoma, but the recovery is shown by the increased deposit of lime salts, giving it the appearance of true bone.

CASE XI.—Dr. X., aged thirty-two years, was referred by Dr. W. W. Babcock, November 11, 1905. He was treated for recurrent sarcoma following removal of the right testicle, and for a metastatic growth in the *left* inguinal region twice the size of a hen's egg. He has recovered and has been well a year and three months. (Pathological study by Dr. Babcock.)

CASE XII.—A small boy, aged four months, was referred by Dr. L. W. Fox, March 19, 1907. A mixed-cell sarcoma had developed at two months of age in the right lower eyelid. It had been removed at the end of six weeks by Dr. Fox. Two weeks after the operation there were signs of a recurrence. This recurrence disappeared after four months and forty-two treatments, and he has remained well over a year.

CASE XIII.—Miss L. G., aged eight years, was referred by Dr. W. W. Babcock, May 7, 1907. Six weeks after a blow upon the jaw she developed a round-cell sarcoma of the upper jaw. The bone was everted, and one week later x-ray treatment was begun. She was given thirty-five treatments between May 7 and July 19, 1907, when she appeared to be well. She remained well five months, when a recurrence followed the extraction of a tooth. This recurrence has again disappeared under treatment. (Microscopic study by Dr. Babcock.)

CASE XIV.—Mrs. S. H. C., aged sixty-nine years, was referred for treatment by Dr. W. W. Babcock, March 26, 1907. She had been operated upon twice. She was treated for recurrent and metastatic melanotic sarcomas upon the leg. After thirty-three treatments, in four months, the signs of the disease had disappeared. She remained well about a year, when there was a slight recurrence. This has again disappeared under treatment. (Microscopic study by Dr. Babcock.)

CASE XV.—Miss S. G., aged fifty-six years, was referred by Dr. Mary Griscom, February 2, 1906. A melanotic sarcoma had been excised from each scapular region three weeks previously. There were signs of recurrence in the wound at the beginning of Röntgen treatment. She received sixteen treatments in two months, when she was well. She has remained well two and one-half years.

CASE XVI.—Dr. H., aged fifty-four years, was referred by Dr. W. W. Babcock, May 17, 1907. Dr. Steel had removed a large melanotic sarcoma from the submaxillary region eight days previously. He was given postoperative treatment thirteen times until May 31, 1907. He is still well one year and four months since treatment. (Microscopic study by Dr. Babcock.)

CASE XVII.—Miss E. P., aged twenty years, was referred by Dr. E. Laplaee, October 11, 1904. She had a sarcoma of the right shoulder, of three years duration, which was twice the size of the shoulder. It had been incised by the family physician for an abscess. Forty-seven treatments were given in ten weeks, with some retardation of the growth. Coley's toxins were then used, but without avail, and she died in a short time. No microscopic examination was made in this case.

CASE XVIII.—Mrs. L. W., aged forty-four years, was referred by Dr. L. W. Fox, May 18, 1906. She had a sarcoma of the left iris, which was reduced to one-half its original size by seventy-seven treatments. There has been no increase in the twenty-two months since treatment.

CASE XIX.—Mr. J. P., aged sixty-two years, was referred by Dr. L. W. Fox, December 13, 1905, on account of recurrent sarcoma of the orbit and metastases at the angle of the jaw. After twelve treatments in two weeks he left the city. The significant fact is that he returned a year later for an operation, but with no increase in the size of the tumors. He died a short time after the operation from a hemorrhage at the site of the wound.

CASE XX.—Mr. W. B., aged sixty-eight years, was referred by Dr. L. W. Fox. He was treated for recurrent sarcoma of the orbit. The pain was relieved after a few treatments. There was some improvement after forty-eight treatments, but the patient became discouraged and left the city.

CASE XXI.—Mr. J. P., aged thirty-seven years, was referred by Dr. Harry C. Deaver. He had a large recurrent sarcoma involving the right supraclavicular region and the side of the neck. He was treated without success.

CASE XXII.—Mr. R. T., aged seventeen years, was referred by Dr. E. Laplaec, March 7, 1904, for treatment of a large angiosarcoma of the right cheek. The disease has been held in check four years.

CASE XXIII.—Mr. W. E. L., aged thirty-six years, was referred by Dr. Weis Hammer, November 18, 1907. He had a recurrence in the wound following the removal of the left testicle, which had become sarcomatous. He also had a metastasis in the left groin the size of a hen's egg. The recurrence and the metastasis disappeared completely in four months after forty-four treatments. He is still well six months since the last treatment.

CASE XXIV.—Miss M. F., aged fifty years, was referred by Dr. John B. Deaver, November 21, 1907. She had a recurrent sarcoma

in the left mammary region and signs of metastasis in the spine. The tumor on the chest had nearly disappeared under treatment, but the spinal metastasis showed no improvement, and later caused her death.

CASE XXV.—Mrs. M. M., aged sixty-one years, was referred by Dr. J. A. Peoples. She had a sarcoma of the right axillary region the size of her two fists, with some signs of mediastinal involvement. The tumor had disappeared, but a sluggish ulcer remained, which was about one inch in diameter. Microscopically this was a large and a small round-cell sarcoma. Coley's toxins were used in conjunction with the Röntgen treatment to improve this ulcer, and with apparent benefit at first, but later showed no benefit and only seemed to cause prostration. She is living a year after the beginning of treatment and is in better condition than at the beginning of the treatment, and I still have hopes of a recovery.

CASE XXVI.—A man, aged forty-five years, with a recurrent chondrosarcoma of the sternum, was referred by Dr. E. Laplace, February 14, 1908. The growth has been reduced to the level of the skin, but is not well, and he is still under treatment.

CASE XXVII.—A woman, aged thirty-six years, was referred by Dr. W. L. Rodman, January 15, 1908. Eleven weeks previously she had an endothelioma removed from the left breast. It was considered exceptionally malignant, and an extensive operation was done. Severe pains in the entire left side of the chest and some swelling in the axilla were present at the beginning of the treatment. Twenty-one treatments were given in three months, with entire relief of pain, no sign of recurrence, and with every sign of health and comfort to date.

CASE XXVIII.—Mrs. A. B., aged sixty years, with a recurrent spindle-cell sarcoma growing from the muscles of the left thigh, was referred by Dr. R. S. Dorsett, October 7, 1907. Under treatment the tumor degenerated and was euretted, but recurrence developed in the wound and she died in nine months from the beginning of treatment.

CASE XXIX.—A boy, aged nine years, was referred by Dr. E. Laplace, June 21, 1906, for postoperative treatment immediately after a resection of the right upper jaw on account of sarcoma. He was given nineteen treatments and has remained well over two years.

For further details of the above cases, the previous reports may be consulted. The following recent cases may be added:

CASE XXX.—Mr. G. N., aged twelve years, was referred by Dr. Warren C. Batroff, March 19, 1908. A small tumor had been growing from beneath the left ear during the past year and a half. At the beginning of treatment it was hard, adherent, slightly painful, and an inch and one-half in diameter. He had been given twenty treatments between March 19 and June 30, 1908, when the tumor

was reduced to one-half its original size and treatment was discontinued. No microscopic examination was made in this case. These fibrous tumors do not disappear entirely, but are reduced in size, and then remain stationary.

CASE XXXI.—Mr. G. R., aged forty-four years, was referred by Dr. E. Laplace, January 14, 1908. Twelve years ago a small tumor developed in the left parotid region, which was removed after three years. It recurred in seven years, and was again removed. It recurred in a year and was again removed. Immediately after the last operation, January 10, 1908, he was treated with the Röntgen rays. This tumor was found to be an endothelioma of the parotid. He was treated eighteen times in about a month, and has remained well since.

CASE XXXII.—Mr. W. U., aged twenty-seven years, was referred by Dr. Ernest Laplace, October 10, 1906. He had been operated upon August 8 and September 6, 1906, for sarcoma of the testicles, with removal of the inguinal glands on account of metastasis. He was given postoperative treatment. He has not answered a recent letter, but it is believed that if he had a recurrence he would have reported.

CASE XXXIII.—Mrs. J. W., aged fifty-nine years, was referred by Dr. J. W. Kennedy, June 12, 1908. Following slight traumatism, she developed a tumor in the right groin, which surrounded the vessels in Scarpa's triangle. A careful dissection was made and the tumor resected as well as possible in April, 1908. There was an immediate recurrence before the wound healed. Röntgen treatment was begun June 12, 1908. Sixteen treatments were given in a month. At the end of this time a superficial dermatitis had developed, but the induration had almost disappeared, and the outlook seems favorable.

CASE XXXIV.—Miss E. M., aged seventeen years, was referred by Dr. W. C. Hollopeter for a tumor involving the gastrocnemius muscle and the outer portion of the popliteal space. It was eight and one-half inches long and irregular in outline. Clinically it appeared to be a sarcoma, but a section removed by Dr. W. L. Rodman and examined by Dr. Henry S. Wieder showed it to be a fibroma. Treatment was begun July 3, 1908. Pain and discomfort have been practically relieved. The tumor is distinctly smaller and softer. She is still under active treatment.

CASE XXXV.—Mrs. M., aged forty-five years, was referred by Dr. John B. Deaver. She injured the left side of her face November, 1906. Nine months later a tumor developed at the site of the injury. The tumor was excised twice within three months, and at the second operation a metastasis was excised from the right side of the jaw. A recurrence developed, and Dr. Deaver excised the left upper jaw January 16, 1908. A recurrence developed at the side of the nose, and was excised by Dr. Deaver. Ten days after this last operation

there was a recurrence present about one inch in diameter. Later a recurrence developed at the site of the operation on the right side of the jaw. Sixty treatments were given in three months. There has been undoubted improvement, but the disease is still present.

Summary of Results in Sarcoma. Of the 35 cases reported, 9 are still under treatment, and have shown distinct improvement. Of the 26 cases in which the treatment has been discontinued, 8 have died and 17 have recovered, or at least were relieved of all symptoms. In other words, of these 26 cases in which treatment has been discontinued, 65 per cent. have recovered. Of the 17 cases that have recovered, 2 have had a recurrence. Case I had a recurrence in four months which followed a slight operation on the nose, from which she died. Case XIII had a recurrence following the extraction of a tooth, from which she has nearly recovered under treatment. Judging from these results, one might expect recoveries in at least 50 per cent. of the cases. When it is considered that practically all of these cases were of the hopeless variety from operative procedure, the results are truly remarkable.

Postoperative Treatment. The above results must not be interpreted as an argument against operation in operable cases. On the contrary, I believe that the best results will follow operation, if immediately succeeded by a thorough course of Röntgen-ray treatment.

Types of Sarcoma. It seems that the best results are obtained in the treatment of round-cell sarcoma, then mixed-cell, and then spindle-cell sarcoma. The three cases of melanotic sarcoma that were treated have recovered.

CARCINOMA. The results obtained in the treatment of carcinoma are much less encouraging. It is difficult to classify and summarize these cases, because I treated all cases that were referred to me, and some were really in a dying condition. In all, I have treated 304 cases of deep-seated carcinoma. I shall base my report upon my general observations and impressions rather than on a detailed statistical study.

Carcinoma of the Breast. I have treated only a few cases of primary carcinoma of the breast, and these were inoperable either because of the extent of the disease or because of the age and general condition of the patient. The results, as a whole, I believe, have been as good as those obtained by other methods in the same class of cases; but I always recommend operation in every operable case, to be immediately followed by a thorough course of Röntgen treatment. Dr. Russell H. Boggs, of Pittsburgh, believes that a course of anti-operative treatment is more important than postoperative treatment, and I believe he is right.

Recurrent Carcinoma of the Mammary Region. If the recurrence is localized, is not associated with metastasis, and is treated early, the most brilliant results will follow. If, on the other hand, it is

extensive and metastasis has taken place, which is true in the majority of cases referred for treatment, we can, as a rule, only hope for palliation and prolongation of life. In nearly all cases there is some reduction in the size of the tumors and relief of pain, so that the patient is made comfortable.

Even though the treatment in this class of cases is only palliative, it is the only treatment that offers this much. At times, even in very advanced cases, when the supraclavicular and mediastinal glands are involved, good results may be obtained. An example of such a case is:

Mrs. R. C., aged sixty-one years, was referred to me by Dr. E. Laplace, October 29, 1903. She had been operated upon two years previously for carcinoma of the left breast. When she was referred to me for treatment, there were two nodules in the scar, respectively one inch and one-half inch in diameter. There were also enlarged supraclavicular glands palpable. She recovered from all these symptoms in three months and after forty-four treatments. Contrary to advice, she left the city for three months. When she returned she had a palsy of the left arm, evidently due to pressure of enlarged supraclavicular glands. There were also signs of enlarged glands in the mediastinum. She recovered in three months, and again left the city for the summer. When she returned in the fall she was again paralyzed in the left arm, and had some atrophy of the thenar and hypothenar eminences of the left hand. Under treatment she nearly recovered the use of the left arm and the hand, but this atrophy has been progressive since, which I believe is now due to secondary degeneration of the nerve. At present she is very weak in the left arm, but I can recognize no evidence of carcinoma.

Even though the results in this case are not all that could be wished for, they are nevertheless remarkable. She is living five years after there was involvement of the supraclavicular and mediastinal glands. During this time she has enjoyed the ordinary pleasures of life.

Carcinoma of the Neck. All of this class of cases were in the terminal stage, and were secondary to and followed operations for malignant disease about the arm or jaw. A number have improved and were made more comfortable for a time, but none of this class has recovered.

Carcinoma of the Jaw. All of this class were likewise recurrent and advanced. None has recovered, but some were free from symptoms for a time and had their lives prolonged a year or more.

Recurrent Carcinoma about the Face. These most commonly follow operations or caustic applications for epithelioma. They most commonly involve the orbit or the nose. If these recurrences are treated early, they will usually disappear. If treated after they have extended into the nasal cavity or one of the sinuses, they seldom recover, though they often show great improvement.

Carcinoma of the Esophagus. The results in this class have surprised me in a number of cases, in which the swallowing of liquids was difficult and of solids impossible at the beginning of treatment. Under treatment they have been able to swallow solid food, have increased in weight, and improved in general health. So far no case has recovered, but four cases under treatment at present are improving.

Carcinoma of the Stomach. I have treated ten cases of this class. All were very advanced and presented hemorrhages and palpable tumors at the beginning of treatment. All were weak and cachectic. Some showed improvement and one seemed to have recovered.

In October, 1904, I was called to a hospital in a neighboring city to see a white man, aged sixty-four years, upon whom an exploratory operation had been performed three weeks previously for carcinoma of the stomach. Dr. Joseph Price, who operated, found the lesser curvature involved by a large carcinoma. He made no attempt to remove it, and did not open the stomach. The man had complained of symptoms referable to his stomach for a year previously. He had two severe hemorrhages.

At the beginning of treatment by means of the Röntgen-rays he was bedfast, and very cachectic and emaciated. His red blood corpuscles numbered 3,200,000, and hemoglobin 55 per cent. After six weeks of daily treatment he was able to walk, had gained in weight, and gained 1,000,000 in red blood corpuscles and 20 per cent. in hemoglobin. He came to the city three times a week for treatment, and at the end of six months was attending to some business. He then developed symptoms of appendicitis. Dr. Price again did an exploratory operation. He found no appendicitis and *no carcinoma*. He found adhesions at the site of the original operation, which he liberated. The patient died in about three weeks, and no autopsy was permitted. This case had at least the outward appearances of success.

Carcinoma of the Rectum. The hopelessness of these cases is recognized by all surgeons. I have seen the best results follow operation and postoperative Röntgen treatment. I am sure I have seen life prolonged a year or more and the patient rendered more comfortable as a result of the treatment.

Carcinoma of the Uterus. Fourteen cases of this disease were treated in its most advanced and distinctly inoperable stage. Two seemed to have recovered, but have drifted out of my reach. One patient, in whom the entire pelvis had been infiltrated with the disease at the beginning of the treatment, seemed to recover, and left the hospital. She was a colored woman, and returned to the hospital a year later for an operation for keloid following an x-ray burn upon the abdomen. At this time she seemed to be free from malignant disease. Pain and discharge are often relieved for a time, but we can seldom hope for recovery.

Postoperative Treatment. Probably the greatest field of usefulness of the Röntgen-rays is in the postoperative, and probably antioperative, treatment, wherever the malignant disease may be located. Boggs recommends this most strongly.

Statistics are not yet available to prove the value of this treatment, but those who have watched the results closely and fairly are favorably impressed with its value. We have all seen recurrences disappear and the patient remain well. It is likely, therefore, that if these carcinoma cells are exposed before they become palpable tumors they should be more easily destroyed. The fact that many surgeons feel positive of its value is a strong argument. An example of such expression is the following: Dr. Griscom says: "I consider it a most important postoperative treatment. The only ease of breast amputation that I have lost in the past four years was one who lived too far away to get the treatment. Some of the cases treated were very far advanced."

These treatments should be given as soon as the patient can be safely moved to the laboratory for treatment. That is, usually within a week after the operation. They should be treated actively, and approximately fifteen or twenty treatments should be given. The glandular area should especially be treated.

TECHNIQUE. The technique of Röntgen therapy in general is difficult to describe, and this is especially true of the technique in the treatment of deep-seated malignant disease, because no two cases are alike, either in the distribution of the disease, in the degree of malignancy, or in the vitality of the patient. It is, however, best described under the following headings:

1. *Time of Exposure.* This will vary with the extent of the disease and with the degree of malignancy. Generally it should be from ten to thirty minutes, and when the exposure is over ten minutes it should be given in more than one direction, always, however, directing it toward the centre of the malignant tissue.

2. *Distance from the Anode.* This will vary with the depth of the disease. The deeper the lesion, the greater the distance of the anode from the skin and the longer the exposure. Generally the distance should be from ten to fifteen inches.

3. *Quality of Light.* Measured by the Benoist scale, it should be between 6 and 7, and this quality of light will be best obtained from an old tube.

4. *Milliampercage Going Through the Tube.* Unless one uses a water-cooled tube, it is difficult to keep a uniform vacuum with more than one milliampere going through it; and one milliampere is what I use.

5. *Frequency.* In a rapidly growing sarcoma, I believe that at first the treatment should be given daily, and after a month or two less often. I believe that carcinoma needs to be treated less frequently; three times a week I consider sufficient.

6. *Duration of the Treatment.* This will vary from a few months to several years. It should be continued, or, at least, the patient should be kept under observation, as long as disease is present, and should be watched closely afterward. The treatments may be given in series, allowing varying intervals depending upon the condition of the patient.

CONCLUSIONS. 1. Cases that are operable should be operated upon, and this should be followed by early and thorough postoperative Röntgen-ray treatment.

2. Sarcomas yield better to the α -rays than carcinomas. In sarcoma it seems from the foregoing results that we may hope for 50 per cent. of recoveries. In the series reported, 65 per cent. have recovered.

3. Localized recurrent carcinoma will usually yield to the Röntgen rays, unless the mucous membrane be involved.

4. Occasionally good results are obtained even in advanced cases of carcinoma, but generally one can hope only for palliation or prolongation of life.

5. Good results will depend very much upon good technique.

I am indebted to the physicians who have referred the patients for treatment, and to Dr. Henry S. Wieder, surgical pathologist to the Medico-Chirurgical Hospital, who made the pathological examinations.

IS PERCUSSION AS A METHOD OF TESTING THE LUNGS DESERVING OF GREATER ATTENTION?¹

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THE thoughtful observer can hardly fail to have noticed that the two methods commonly employed for testing the lungs, percussion and auscultation, as they are now taught and practised, differ fundamentally from each other in one respect: in auscultation the usual procedure is to apply the stethoscope to a certain spot on the thorax and then directly to observe the character of the respiratory sound, the inspiration, the expiration, rales, etc. In percussion, on the other hand, it is not the character of the percussion sound which is regarded as of primary importance, but with an earnestness and enthusiasm, worthy of more weighty objects, the importance of percussing symmetrically and comparing the percussion sounds at symmetrically situated spots is taught and practised. It is true that

¹ Read at the International Congress on Tuberculosis, Washington, D. C., September-October, 1908.

phenomena of auscultation are also studied by the symmetrical-comparative method, but this is merely a subsidiary procedure, which ensues after the character of the respiratory sound has been determined, and thus not until a necessary foundation has been laid, without which the comparison would be quite valueless. The symmetrical-comparative method at present enjoys far too great a vogue to the prejudice of percussion as such and its development in the future. As a rule, the investigation does not proceed farther than to the examination of the difference in the percussion sound at two particular spots which are compared, and consequently sticks at that point, not advancing to the really essential point of the percussion, that is, the determination of the special character of the percussion sound itself, that is, to a judgment analogous to that pronounced in the case of auscultation.

The symmetrical-comparative method is obviously inadequate for establishing how far dulness is present or for determining the degree of dulness, as long as the character of the percussion sound (non-tympanitic, tympanitic, more or less dull, etc.), with which the sound under examination is being compared, has not previously been ascertained. The method of auscultation has, as I have already pointed out, a decided advantage at this stage. Having this firm ground to build on, auscultation precludes the occurrence of such errors as declaring that no alteration of the respiratory sound is present, simply because the symmetrical-comparative auscultation has not shown any difference in the respiratory sound at the points which are being compared, whether the sound is vesicular, bronchial, amphoric, or whatever it may be. In percussion, on the other hand, analogous errors as regards, for example, the existence of dulness, are quite conceivable, and as a matter of fact, as I have shown,² are of frequent occurrence. And these shortcomings can never be got rid of until the essential element in percussion, that is, the determination of the character of the percussion sound, is put in the first place, and the symmetrical-comparative method now in vogue is relegated to a secondary position.

The defects of the symmetrical-comparative method are in the main as follows: (1) If there is dulness in the percussion sound at two symmetrical spots, and the difference in the degree of dulness is indistinct, as is not infrequently the case, the dulness may remain unnoticed at both spots. (2) If there is dulness in the percussion sound at two symmetrical spots, and the difference in the degree of dulness is distinct, which often occurs, the dulness at the spot where the degree of dulness is greater may be miscalculated, that is, underestimated, and the dulness at the other spot may be neglected altogether.

It is a vital matter for present-day diagnostics not merely to be

² En studie i perkussion af lungorna, *Hygiea*, 1904, p. 125.

able to decide the question, "tuberculosis or not?" or, so to speak, to make a qualitative diagnosis, but also to determine at what stage the disease is, that is, to make a quantitative diagnosis. For this latter purpose it is necessary to determine the degree of dulness as well as the existence of dulness itself, to decide, for instance, whether a high or a low degree of dulness³ is present.

To those who have not thought over the matter carefully or have not had an opportunity of testing and comparing the pronouncements of various investigators on the dulness and degree of dulness, it might seem that the task is comparatively simple. One author⁴ even ventures to assert, that if the dulness be more distinct, for example, D³, D⁴, and D⁵ (see below), it would be impossible for two observers to hold different opinions. My investigations have shown that just the reverse is the case; that in the question as to dulness great confusion prevails, that different observers, on the contrary, often arrive at widely different results even, and, indeed, as I shall explain later, especially with regard to the high degrees of dulness.

It is impossible for us to escape from this regrettable fact, which must be patent to all who will take the trouble to study the evidence. The explanation lies ready to hand: (1) As I have shown in the symmetrical-comparative percussion method, an existing dulness is often ignored or underestimated; (2) the judgment is dependent on the investigator's more or less trained, more or less keen, susceptibility to sound; and (3) there exist no recognized definitions for degrees of dulness in lung percussion. Under the present conditions this aspect of percussion lies to such an extent at the mercy of subjectivity that, practically speaking, it has hardly any value at all. No wonder then that we are continually hearing auscultation praised at the expense of percussion, and that some even go so far as to assert that the former method may be used to check the latter.⁵ It is owing to the misuse of the symmetrical-comparative method that percussion, as a whole, has fallen into discredit. Percussion still remains a quite independent method of investigation, which permits as little of checking by means of auscultation as vice versa. But this would lead me into the question whether both these methods and others besides are not required for a determination of the state of the lungs, a question which I need not enter into here.

Another defect of the symmetrical-comparative method, which is a corollary of those above mentioned, has been even less observed than they: that is, that the degree of dulness in general, and more especially when it is considerable, is regularly underestimated, and to such extent is this so that it is actually a very rare occurrence

³ Turban-Gerhardtsche Stadieneinteilung d. Tuberculosis, Kaiserl. Gesundheitsamt, 1907, p. 560.

⁴ O. V. Petersson, Om tuberkulinprosoet och tidigdiagnosen af lungtuberkulos, Upsala, Läkarefören. forhandl., Band ix, Heft 5 and 6.

⁵ Israel Rosenthal, Hvorledes bør man perkutere Lungerne? Bibl. for Læger, 1904, p. 479.

to find a high degree of dulness registered, for example, in medical reports.

A little reflection will easily guide one to the explanation, if we bear in mind: (1) That the attention in the symmetrical-comparative method of percussion is directed to the difference in the dulness of the percussion sound at the two points which are being compared; (2) that in cases of tuberculosis of the lungs dulness regularly occurs on both sides of the lungs;⁶ and (3) that the difference in the degree of dulness at symmetrical points is comparatively slight. Assume, for instance, that on the right side we find the degree of dulness D³ and on the left D². The difference between D³ and D² is D¹, from which we judge that a low degree of dulness is found on the right side. Or, again, we find D⁵ on the right side and D² on the left. From the difference D³ we pronounce it to be a medium degree of dulness on the right, etc. This means that the degree of dulness is underestimated and that the high degree of dulness does not have a chance of coming under observation.

This defect comes to light when we examine the easuries, even of such a famous investigator as Turban.⁷ This author, who, like so many others, recommends—with some reserve—the symmetrical-comparative method, has in the definition of a severe lung affection⁸ included among other determinations a high degree of dulness. Now, when we peruse the 106 cases in Turban's third stage, among which many severe cases of lung affection are to be found, we might naturally expect to find a high degree of dulness frequently registered. This is, however, not the case. As a rule, about 250 times, only "dulness" has been registered, without assigning the degree of dulness; about 50 times we find "slight dulness" or other expressions indicating a low degree of dulness, and only five times do we find a high degree of dulness registered.

When in cases of tuberculosis of the lungs we hear of different degrees of dulness, a low, a medium, and a high degree of dulness, short tone, etc., there seems, as a rule, to be no exact notion of what it is that is dull, whether it is the whole complex of sounds, the percussion sound as a whole, or only a part of it, and in that case which. In most cases an analysis of the sound complex is not resorted to, but it is considered sufficient to pronounce judgment on the sound, as a whole, as more or less dull. Thus, it seems to be a common procedure to compare the degrees of dulness at symmetrical spots of, for example, a non-tympanic sound on one side and a tympanic sound on the other. It can readily be understood that in this or similar procedures

⁶ C. E. Waller, loc. cit. As we know, Turban has previously proved that the respiratory sound also in the case of tuberculosis of the lungs is, as a rule, abnormally formed on both sides, at least at the apices. This fact, as well as the points to which I have drawn attention regarding the dulness, bear out the view that tuberculosis of the lungs is a double-sided disease even at an early stage, though, as a rule, it attacks one lung somewhat more than the other.

⁷ Beiträge z. Kenntniss d. Lungentuberkulose, Wiesbaden, 1899.

⁸ Loc. cit., p. 31.

most unreliable results may be yielded by the percussion, and the investigators may be startled when they proceed to auscultation by the occurrence of contradictory phenomena, such as rales, highly audible, prolonged expiration, etc., in places where no dulness whatever or only slight dulness was previously found.

In order to get a suitable basis from which to investigate the degree of dulness it is necessary, before the symmetrical-comparative percussion is undertaken, first to observe and study the character of the percussion sound, to see whether it is non-tympanitic, tympanitic, dull, or clear, etc. Among the percussion sounds which are to be heard from the lungs, three principal kinds may be distinguished: (1) The non-tympanitic sound; (2) the tympanitic sound which is to be heard, for example, over relaxed lungs, the relatively tympanitic sound; (3) the tympanitic sound heard over a cavity, which is of the same nature, though not of the same pitch, as the percussion sound from the trachea, or what we may call the tracheal tympanitic sound.

The percussion sound from normal lung tissue includes in a great measure the so-called non-tympanitic sound, characteristic of normal lung tissue, which has long been known. Now, can this sound, the normal lung sound, serve as a basis for determining the degree of dulness?

If we follow the vicissitudes of the non-tympanitic sound in different stages of the development of lung tuberculosis, from the incipient stage to cavity formation, we find the following results: The clear non-tympanitic sound which is heard under normal conditions upon a slight tap (*e. g.*, in the lateral part of the fossa infraclavicularis), becomes first somewhat or distinctly short and is at the same time commingled more and more with the tympanitic sound, characteristic of relaxed lung tissue. This latter sound can thus be heard at a certain stage of development from a part (the beginning) of the inspiration and (the end) of the expiration, while the non-tympanitic sound is still heard from another part (the end) of inspiration and (the beginning) of the expiration. When the development has proceeded further, the non-tympanitic sound is no longer heard in ordinary respiration at any part of the phases of respiration, but in forced respiration it is still heard at the end of the inspiration and the beginning of the expiration.⁹ All these variations belong to the incipient stage of tuberculosis of the lungs and form together what we should place under the heading of "slight dulness." As the process goes on, the non-tympanitic sound is inaudible upon a slight tap, even if the respiration is forced. It has as it were fallen out of the game beyond the range of slight percussion, but during the next stage of development it can be produced by augmenting the strength of the percussion. For in

⁹ This seems to answer to what Aufreicht terms "Umkehr des Perkussionschalles." See p. 137 in his book *Pathologie und Therapie d. Lungensehwindſucht*, Vienna, 1905.

proportion as the process goes on with increasing infiltration, it will be necessary to increase the strength of the percussion to produce the non-tympanitic sound, until at last it is no longer heard even following a sharp (not, of course, a violent) tap. This latter symptom corresponds to the stage of the permanent infiltration with or without incipient softening. In the final, the cavity stage, the non-tympanitic sound is still inaudible even upon a sharp tap. In this stage the tracheal tympanitic sound, with its well-known sound-variation phenomena, enters on the scene.

On the basis of these sound variations, that is, the behavior of the non-tympanitic sound upon percussion of different degrees of strength, I have founded a new method of percussion for determining the degree of dulness. It is distinguished from the old method mainly by the fact that the degree of dulness in cases of lung tuberculosis is not judged according to the degree of dulness in the percussion sound as a whole, but only in a certain part of it, that is, the non-tympanitic sound.

In 1903 I pointed out for the first time—in the Swedish Medical Society at Stockholm—the shortcomings of the symmetrical-comparative method and described my own method of percussion. In the following year this was published in the periodical of the society, *Hygiea*. I shall now give, with the utmost brevity and conciseness, a sketch of that method, with the additions and modifications which have proved to be necessary in the course of its development.

This is how it runs in summarized form:

1. *Weak Percussion:* (a) The non-tympanitic sound is heard throughout the respiration, though somewhat or distinctly short: First degree of dulness (sign: D¹).¹⁰ (b) The non-tympanitic sound is heard only during a part of the respiration, when the breathing is ordinary or forced: Second degree of dulness (sign: D²). (c) The non-tympanitic sound is quite inaudible. The strength of percussion is increased to

2. *Medium Percussion:*¹¹ (a) The non-tympanitic sound is heard: Third degree of dulness (sign: D³). (b) The non-tympanitic sound is not heard. The strength of percussion is increased to

3. *Strong Percussion:* (a) The non-tympanitic sound is heard: Fourth degree of dulness (sign: D⁴). (b) The non-tympanitic sound is not heard: Fifth degree of dulness (sign: D⁵).

By this new method, for some years employed by a number of Swedish doctors, it is not merely possible to determine the different

¹⁰ This simpler designation corresponds to those first proposed: slight, slight relative, almost relative, relative, and strong relative, which were discarded as unsuitable.

¹¹ As the expressions "medium" and "strong" percussion might possibly convey the impression that a really strong tap was intended, such as is still sometimes heard, for example, when percussion is being demonstrated to an audience, I should perhaps have used the terms "less weak" and "still less weak," etc., in order to emphasize the importance of weak percussion, but from linguistic considerations and presuming that no practitioner who really knows his business will misconceive me, I prefer to retain those I have used above.

degrees of dulness with greater accuracy, so that, for instance, a difference in the degree of dulness from one examination to another can be more exactly determined, and the different degrees of dulness, even the higher ones, be more correctly estimated: the method also enables the examiner to detect without any great difficulty an incipient dulness at an earlier stage than is now generally the case. Moreover, when this method is employed, different examiners are, relatively speaking, much more in agreement in their determination of the degree of dulness present than they were before. The results can, furthermore, be arrived at without recourse being had to the symmetrical-comparative method. The latter method of percussion consequently should be relegated to a subordinate place, just as the analogous symmetrical-comparative method of auscultation is employed in conjunction with, but subsidiary to, the method of auscultation.

Beyond the range of the five degrees of dulness enumerated above lies the degree of absolute dulness, that is, the percussion phenomenon we meet with in cases of pleuritic exudations, well known to the medical practitioner.

In view of the known difficulties presented by percussion in the supraclavicular and supraspinous fossæ, as pointed out by Tsak Jundell in a noteworthy monograph,¹² and by others, the following practical advice may be given to anyone intending to adopt the new percussion method. Begin the percussion of the back and the front not at the fossæ above mentioned, but at the places which, under normal conditions, yield a clear and full percussion sound, namely, in front of the infraclavicular fossa somewhat laterally to its centre, and on the back in the neighborhood of the angle of the scapula in the infrascapular space or in the trigonum stetoscopium.

Having as a preliminary carefully noted the character of the percussion sound—its degree of dulness in accordance with the new method—at the points just mentioned, we can then go on to percuss at the supraclavicular fossa, etc., first on one side and then on the other, at the front, on the side, and on the back.

Percussion of the back offers special points of interest. If one begins, for instance, at the trigonum stetoscopium on the left side one finds the non-tympanitic sound, and then proceeds making the percussion from below upward, being careful to notice when this sound is no longer heard at a slight tap (is superseded, for instance, by the relâchement tympanitic sound), he will find, as a rule, on applying the same method of percussion on the other, the right side, that the limit of the audible non-tympanitic sound reaches higher up on the side where a lesser degree of dulness is heard in front in the infraclavicular fossa. Thus, for instance, if D⁴ has been

¹² Beinerkungen zur Percussion der Lungenspitzen, Zentralblatt f. innere Medizin, 1904, No. 17.

found in the left infraclavicular fossa and D⁵ in the right, the said limit will be found on the back to reach somewhat higher up on the left than on the right. This is such a regular occurrence (save only in the ease of the crossed dulness described by Turban¹³) that this percussion phenomenon can serve to check the accuracy of the determination of the degrees of dulness in front in proportion to each other.

As in ordinary cases of tuberculosis of the lungs, the higher degree of dulness is to be sought in the upper part of the lungs, and the degree of dulness, as a rule, diminishes from above downward, it will in many cases be found quite sufficient for practical purposes, for example, for determining the stage which the disease has reached, for comparison of the state on other occasions of examination, etc., to register out of the whole result of the percussion only the following

points: In front the degree of dulness in the infraclavicular fossæ on both sides (in the supraclavicular fossa the degree of dulness is often the same as or merely one degree higher than in the infraclavicular fossa; of course, if the difference is greater, it should be entered, for example infraclavicular fossa D², supraclavicular D⁴); and on the back the position of the said limit of the non-tympanitic sound (for example, at the line of the spinous processes of the different vertebrae).

It was noted above, as one of the defects of the ordinary symmetrical-comparative method of percussion, that a high degree of dulness is but rarely observed, and examples were given from Turban's casuistries. By way of comparison and as a proof that the new percussion method yields much more trustworthy results I may be allowed to point out that after the examination of the same number of diaries (106), (taken in numerical order and thus not selected) dealing with patients likewise in Turban's third stage (at the Halahult Sanatorium, 1907), a slight degree of dulness (D¹ and D²) was found registered 35 times, a medium degree of dulness (D³) 94 times, and a high degree of dulness (D⁴ and D⁵) 133 times. Analogous results, likewise decidedly in favor of the new method of percussion, have also been obtained by a similar comparison made as regards patients in Turban's first and second stages.

Opinions may differ as to the suitability of the number of degrees of dulness. Some consider three degrees sufficient, for example, weak, medium, and strong; others perhaps would content themselves with two, weak and strong. There are, however, grounds—apart from the facility which it would afford for finer shading—which speak for the suitability of a somewhat greater number. By subdividing the slight dulness into two degrees (D¹ and D²), greater attention is bound to be drawn to slighter degrees of dulness, which consequently will not so readily escape observation. The medium

degree of dulness (D^3), which is of such frequent occurrence both in milder and in more severe cases of lung affection, should, of course, exist as a separate category. Finally, the two degrees of strong dulness (D^4 and D^5), cannot but be differentiated, and that for a special reason. It is in the fifth degree of dulness (D^5) that the phenomena of sound variation, noticed long ago by Wintrich and others, are almost exclusively (according to calculation in more than 90 cases out of 100) to be found. Wherever D^5 occurs those phenomena must be looked for. The fifth degree of dulness consequently constitutes in itself a reply to the hitherto unanswered question: In what cases may the sound variation phenomena be looked for? Indeed, with this clue to guide us, the phenomena are met with much oftener than formerly, when it was, as it were, quite by accident that one came across them. In Turban's casinistries, above referred to, of the 106 cases in the third stage, we find "Schallwechsel" mentioned 8 times. If we examine an equal number of cases (taken in numerical order) in the same stage from the Halalhult Sanatorium, 1907, we find Wintrich's phenomenon entered 37 times (not counting 5 dubious cases). The difference would doubtless have been still greater if the Halalhult cases had been as far advanced as the Davos cases, which, judging by other symptoms, seems nowise to have been the case.

There is another circumstance, however, which must have contributed in some measure to the detection of such a comparatively large number of cases of Wintrich's phenomenon, and that is the employment of a new technical detail in percussion. The indirect percussion of the lungs, as we know, should, as a rule, be made with a slight tap on the plessimeter firmly pressed against the chest wall. There is one exception to the rule as to a slight tap, that is, the mode of percussion mentioned above for determining the higher degrees of dulness (D^3 , D^4 , and D^5). There is likewise an exception to the rule as to the plessimeter being pressed firmly against the chest wall, that is, when percussing for the tracheal tympanitic sound. For that sound comes out more plainly, purer, and less obscured by or mixed with other sounds if the examiner does not press the plessimeter finger (the author employs finger-finger percussion almost exclusively) firmly against the underlying structures, but, holding it straight and firm by its flexor and extensor tendons allows the ball of the finger to pass with the utmost lightness over the skin, while with the hammer-finger (the top or ball of the finger) he percusses "staceato" on the back of the last phalanx of the plessimeter finger. With the aid of this technicality it will often be comparatively easy thoroughly to percuss the entire region (for example, the supracleavicular and infraclavicular fossa), where the tracheal-tympanitic sound and its sound-variation phenomena occur. This sound and its variations in ordinary cases of tuberculosis of the lungs will at first be observed

on tapping the clavicle.¹⁴ Direct percussion on the clavicle with this object in view is performed not by percussing as usual with the top of the finger (Fig. 1) but with the ball of the finger (Fig. 2).

CONCLUSION. 1. By noticing the varying character of the non-tympanitic sound upon different strengths of percussion, dulness can be detected and its degree established with greater certainty and quite independently of the symmetrical-comparative percussion method.



FIG. 1



FIG. 2

FIG. 1.—Showing how the fingers should be held in ordinary direct percussion. Finger-top percussion.

FIG. 2.—Showing how the fingers should be held in direct percussion of the tracheal tympanitic sound. Finger-ball percussion.

2. The symmetrical-comparative percussion method, as usually applied, is inadequate and misleading for the determination of the presence and the degree of dulness; it should, therefore, be dislodged from the prominent position it now occupies.

¹⁴ Naturally not to be confused with the similar percussion sound from the trachea.

SPECIFIC AIDS IN THE DIAGNOSIS AND PROGNOSIS OF TUBERCULOSIS.¹BY SILVIO VON RUCK, M.D.,
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I PURPOSE to consider the relative value of specific aids in the diagnosis and prognosis of tuberculosis; first, of tuberculin in its various methods of application, and second, of the serum reactions and particularly the agglutinin reaction, in the light of my own investigations as compared with those of other observers.

With the introduction of tuberculin a most valuable aid was afforded in determining the presence or absence of tuberculous affections in doubtful cases, and increased interest in the subject was actively aroused by the almost simultaneous and independent communications of Wolff-Eisner² and Calmette³ of their conjunctival method, and of von Pirquet's⁴ cutaneous method of applying tuberculin for diagnostic purposes.

From the literature I have collected a large number of results of the use of the subcutaneous, cutaneous, and conjunctival methods respectively.⁵ From a tabulation of these results, it appears that, by the subcutaneous method, among 7088 cases tested there were 4805 tuberculous, in 4319 of which the reaction was positive; 479 suspects, with 313 positive reactions; and 2804 non-tuberculous cases, in 1440 of which positive reactions occurred. By the conjunctival method, among 6449 cases tested, there were 2734 tuberculous, in 2164 of which reaction was positive; 1188 suspects, with 687 positive; and 2527 non-tuberculous subjects, with 347 positive reactions. By von Pirquet's cutaneous method, among 6504 cases tested there were 2182 tuberculous, with 1861 positive reactions; 815 suspects, with 550 positive reactions; and 3507 non-tuberculous subjects, in 1109 of whom the reaction was positive. The latter figures include results in 900 non-tuberculous children, of whom 149 had reacted positively. Excluding these cases, there are positive results in 1060 out of 2607 non-tuberculous adults.

The percentages of cases in which positive reactions followed the application of the tests were, respectively:

¹ Read by title at the International Congress on Tuberculosis, Washington, D. C., October 3, 1908.

² Berl. med. Ges., May 15, 1907. Discussion zu v. Pirquet's Vortrag., Berl. klin. Woch., 1907, xlii, 700.; Beitr. z. Klin. d. Tuberk., 1908, ix, 1.

³ Presse médicale, June 19 and July 13, 1907 (cf. Zentralbl. f. Chir., 1907, xxxiv, 1031).

⁴ Berl. med. Ges., May 8, 1907 (cf. Berl. klin. Woch., 1907, xlii, 644, 700); Wien. med. Presse, 1907, xlvi, 155; Kutane und konjunktivale Tuberkulinreaktion, in Krause and Levaditi, Immunitätsforschung, Jena, 1908, I, 1035 (1042); Wien. klin. Woch., 1907, xx, 1123; 1908, xxi, 623.

⁵ Owing to lack of space, it has been necessary to omit this and all other tabulations prepared for this paper. The literature has been considered up to July, 1908.

	Tuberculous. Per cent.	Suspects. Per cent.	Non-tuberculous. Per cent.
Subcutaneous	89.88	63.34	51.30
Conjunctival	79.20	57.80	13.73
Cutaneous	85.29	67.48	31.62
Exclusive of children, 40.66			

At the Winyah Sanitarium tuberculin has been injected for diagnostic purposes since 1891 in 300 cases, with positive reactions in 75 per cent. at a period of the disease in which tubercle bacilli were absent from the sputum or in which there was no expectoration. The conjunctival method has been applied in 127 cases, 101 tuberculous and 26 non-tuberculous. Of the tuberculous, 23 were cured or arrested cases which had been treated specifically and discharged from one to ten years previously, and whose health had remained good. Thirty-four were, at the time, under treatment with specific remedies; the additional 44 cases were tested on admission to the institution, and had not been so treated.

For the tests, solution of the alcoholic precipitate of tuberculin prepared, according to Calmette's formula, from tuberculin from human tubercle bacilli, was used, and also an identical preparation from bovine bacilli.

Of the 23 cured and arrested tuberculous cases, none reacted to instillations of human purified tuberculin into the right eye. In 16 of these, bovine tuberculin was instilled into the left eye; 9 failed to react, in one there was a trace, in 4 the reaction was positive in the first degree, in one in the second degree, and in the other, in which there was a chronic conjunctivitis, a severe third-degree reaction accompanied by fever occurred. This latter case, however, failed to react to cutaneous application of human tuberculin. All these patients had been treated with specific products of human tubercle bacilli.

Of the 34 cases in which the test was made while under specific treatment, instillations of human purified tuberculin were made in the right eyes of 33. There was no reaction in 18, while in 15 the reaction was positive—slight in 9, of the first degree in 4, and of the second degree in 2. Of the 18 cases which failed to react to instillations of human purified tuberculin into the right eye; 14 received purified bovine tuberculin into the left eye, with positive results in 11, while 3 proved negative to both preparations. Of 12 cases which had reacted positively to human, 11 reacted also to bovine tuberculin in the other eye. Of the 44 tuberculous patients who had received no specific treatment, 28, or 63.64 per cent., reacted positively to first instillations of human tuberculin in the right eye. Two additional cases reacted to a second instillation of the same preparation in the same eye. The remaining 14 were negative. Of the same 44 cases, 30 received also instillations of bovine tuberculin in the left eye. Of these 30, the reaction was positive to both preparations in 14, negative to both in 7, positive to human but

negative to bovine tuberculin in 2, negative to human but positive to bovine tuberculin in 7, to the first instillations respectively. Deducting the 7 cases in which neither preparation caused reaction, there is a total of 37 (84.09 per cent.) in which the reaction was positive.

There remain for consideration the 26 non-tuberculous cases, all of which were in good health and free from suspicion of infection. None reacted to instillations of human tuberculin into the right eye; 10 received second and third instillations with solutions up to 4 per cent. in strength of this preparation into the same eye, with entirely negative results. Bovine tuberculin in 1 per cent. solution was also instilled into the left eye of 18, likewise with negative results.

Colin,⁶ Fritz Levy,⁷ Klieneberger,⁸ Schenck and Seiffert,⁹ Rosenau and Anderson¹⁰ and others have found that clinically non-tuberculous persons react to second or third instillations of tuberculin into the same eye after previous instillations have been negative. It has therefore been objected that such repeated applications cause local hypersensitivity of the conjunctiva, and thus render the reaction of no clinical value. Roepke,¹¹ however, denies that in persons free from tuberculosis repeated instillations into the same eye cause reaction, and, moreover, insists that only such repeated instillations of tuberculin, in solutions up to 4 per cent., are sufficient to cause reaction in all active tuberculoses. The negative results of repeated instillations reported by Smithies and Walker,¹² and my own experience in the ten cases already mentioned, incline me to Roepke's view, but the question requires further investigation.

It is of interest to note that the percentages of positive reactions to the first instillation of human tuberculin in my own tuberculous cases bear a very evident relation to the employment of specific medication:

	Per cent.
Of 44 untreated cases, the reaction was positive in	63.64
Of 34 cases under treatment, the reaction was positive in	44.1
Of 18 cases under treatment for six months or longer, the reaction was positive in	27.77
Of 23 cured or arrested cases which had received specific treatment, the reaction was positive in	None

Such an influence has been observed by others also. Mitulescu¹³ reports six cases treated specifically and apparently cured, in all of which reaction was negative, and like experiences are recorded by

⁶ Berl. klin. Woch., 1907, lxiv, 1507.

⁷ Deut. med. Woch., 1908, xxxiv, 94.

⁸ Ibid., 777; Münch. med. Woch., 1907, liv, 2588.

⁹ Münch. med. Woch., 1907, liv, 2269.

¹⁰ Jour. Amer. Med. Assoc., 1908, I, 961.

¹¹ Beitr. z. Klin. d. Tuberkulose, 1908, ix, 353.

¹² Jour. Amer. Med. Assoc., 1908, I, 250.

¹³ Wien. klin. Woch., 1908, xxi, 727; Deut. med. Woch., 1903, xxix, 367).

Schultz-Zehden,¹⁴ King,¹⁵ Citron,¹⁶ Lenhartz,¹⁷ Damask,¹⁸ and others. The fact that patients while under specific treatment, as will be shown later, acquire a progressive increase of their serum-agglutinating power, and that the specific amoebocyte becomes likewise present in greater quantitative degree, would seem to indicate that, as specific resistance to the pathogenic action of the tubercle bacillus increases, patients react to tuberculin with less and less frequency, and finally not at all.

It may, therefore, be asserted, that the conjunctival tuberculin test may supply the final proof of a cure, just as subcutaneous injections of tuberculin have been administered for the same purpose. In a former publication jointly with Dr. Karl von Ruck¹⁹ I have called attention to the value of the tuberculin test in this respect, which Heron²⁰ considers as a corollary to the diagnostic value of tuberculin.

The test has also thus been employed by Bandelier,²¹ Holdheim,²² and by Mitulescu, who considers as actually cured only such cases as fail to react to tuberculin. Further prognostic inferences I have been unable to draw from my own studies thus far, and I have not observed any apparent relation between the degree of reaction to either the conjunctival or the cutaneous test and the severity or extent of the disease, which would lead to the modification of a prognosis based upon other considerations. Therefore, like Klieneberger, Schroeder and Kaufmann,²³ and especially Roepke, I cannot subscribe to the opinions expressed by Stadelmann and Wolff-Eisner,²⁴ Damask, Heinemann,²⁵ and Fritz Levy in this respect.

Cutaneous tuberculin tests have also been made at the Winyah Sanitarium in 107 cases, both human and bovine tuberculin having been employed in nearly all. Of 67 clinically tuberculous patients tested with human tuberculin in 50 per cent. solution, a positive reaction occurred in 44, in 4 the reaction was doubtful, and in 19 the result was negative. Of these 67 cases, 60 were also tested with bovine tuberculin in 50 per cent. solution; 24 gave a positive reaction, in 1 the reaction was doubtful, in 35 it was negative. Between the two tests in most cases about two weeks elapsed, the human tuberculin having been employed first. The above cases were in most instances receiving specific treatment when the tests were made.

Of 16 cured cases in which the tests were applied simultaneously (that is, human and bovine tuberculin), 12 reacted positively to a 50

¹⁴ Therapeut. Monatsh., 1908, xxii, 177.

¹⁵ Medical Record, 1907, lxxii, 976.

¹⁶ Berl. klin. Woch., 1907, xliv, 1052; Deut. med. Woch., 1908, xxxiv, 316.

¹⁷ Münch. med. Woch., 1907, liv, 2404.

¹⁸ Wien. klin. Woch., 1908, xxi, 121.

¹⁹ A Clinical Study of 261 Cases of Pulmonary Tuberculosis, Asheville, N. C., 1905, p. 17; Journal of Tuberculosis, 1899, I, 179.

²⁰ Transactions of the British Congress on Tuberculosis, 1901, London, 1902, iii, 84.

²¹ Deut. med. Woch., 1902, xxviii, 357.

²² Berl. klin. Woch., 1904, xli, 1040.

²³ Münch. med. Woch., 1908, lv, 62.

²⁴ Deut. med. Woch., 1908, xxxiv, 227.

²⁵ Münch. med. Woch., 1908, lv, 556.

per cent. solution of human tuberculin, 1 was doubtful, and 3 were negative. To the bovine tuberculin 9 gave a positive and 7 a negative reaction. Of 24 clinically non-tuberculous persons, mostly tested simultaneously with both preparations, 12 gave a positive result, in the case of human tuberculin, 1 gave a late reaction (three days), 11 were negative. To the bovine tuberculin 6 gave a positive reaction and 18 were negative.

In the entire material there were only 4 second degree reactions to human tuberculin, and 3 to bovine. In general the reactions were very mild. In one case classed as "cured," in which 1 per cent. bovine purified tuberculin was instilled into the left eye at the same time at which both cutaneous tests were made, the temperature rose to 100.2° F. the next day. The reactions persisted for several days, up to one week, pigmentation being visible for several weeks after vaccination.

My own experience, like that of many others, has been that the respective results are often contradictory and warrant no definite conclusions. It should be mentioned, however, that, with two exceptions, those tested were all adults, for whom v. Pirquet himself asserts the method to be unreliable. With Detre's²⁶ modification, which consists in substituting the filtrates of respectively human and bovine cultures for the concentrated tuberculin, and by the reaction to which he claims to differentiate the type of infection, I have had no experience. Neither have I tested any patients after Moro's²⁷ and Lignière's²⁸ methods.

The specific nature of both the conjunctival and the cutaneous tuberculin reactions has been denied by various writers, for reasons similar to those some years ago alleged in evidence that the reactions induced by subcutaneous injection of tuberculin should not be so considered.

For all three methods it has been objected that reactions occur in health and in other diseases, notably in typhoid fever. Of 70 cases of the latter affection which I have found in the literature, positive reactions followed conjunctival instillations of tuberculin in 20, or 28.57 per cent. I shall enter into the question of the reaction in typhoid fever patients more fully when considering the serum reactions. Suffice it to say that these apparent contradictions can neither militate against the specific nature of tuberculin reactions nor minimize their diagnostic value, since the percentage of positive results is quite generally in harmony with autopsy findings of tuberculosis in the clinically non-tuberculous, and not only in the adult, but it also corresponds very closely in children to the frequency of infection as shown postmortem with advancing age.

²⁶ Wien. klin. Woch., 1908, xxi, 173.

²⁷ Münch. med. Woch., 1908, iv, 216.

²⁸ Recueil d. méd. vétér., etc., 1907, lxxxiv, 514 (cf. Zentralbl. f. Bakter., Ref. 1908, xli, 81).

Thus Schreiber³⁰ reported, in 1891, subcutaneous injections of tuberculin, even up to 10 mg. as an initial dose, in 40 newborn children, with negative results in all. By Binswanger³⁰ 261 children under one year of age were injected, with positive reactions in 35, or 13 per cent. Forty-two of these children came to autopsy; 16 of them had reacted positively, and all these were found tuberculous. Of the 26 remaining children who had not reacted, 25 were found to be free from tuberculosis.

According to the conjunctival tuberculin test practised in 294 children, Ausset³¹ has also confirmed in general the findings as to frequency of tuberculosis in childhood. The percentage of positive reactions rises gradually after the first three months of life, as is shown in the following table:

13 children, 0 to 3 months								0, or 0.01 per cent.
53 " 0 to 1 year								8, or 15.09 "
31 " 1 to 2 years								7, or 22.5 "
23 " 2 to 3 "								8, or 34.7 "
33 " 3 to 4 "								12, or 36.3 "
22 " 4 to 5 "								9, or 40.9 "
17 " 5 to 6 "								10, or 58.8 "
21 " 6 to 7 "								9, or 42.8 "
19 " 7 to 8 "								13, or 68.4 "
10 " 8 to 9 "								6, or 60.0 "
65 " 9 to 15 "								38, or 58.4 "

For the cutaneous method, v. Pirquet reports reactions according to age in 988 children, as follows:

	Months.								Years.				Total.
	0-3	3-6	6-12	1-2	2-4	4-6	6-10	10-14	14+				
All cases	147	64	67	86	127	101	182	100	112	988			
Positive	—	3	11	21	47	54	106	68	100	407			
Per cent.	—	5	16	24	37	53	57	68	90	41			
Clinically non-tuberculous:													
Cases	147	50	59	65	92	58	111	64	37	693			
Positive	—	—	2	1	11	11	39	35	26	125			
Per cent.	—	—	3	2	13	17	35	55	70	18			

N. B.—The actual totals are 986 cases instead of 988, with 410 (not 407) reactions. There are 683 (not 693) clinically non-tuberculous, with 125 positive reactions. S. v. R.

Like statistics, for both children and adults, presented by Petruschky³² include 460 cases of all ages, in which the age frequency of cutaneous reactions to tuberculin is given below:

³⁰ Klin. Jahrbuch, Ergänzungsband, Berlin, 1891, p. 657.

³¹ Arch. f. Kinderheilk., 1906, xliii, 121.

³¹ Revue de méd., 1908, xxviii, 359.

³² Tuberculosis, 1908, vii, 155.

Age.	Cases.	Positive.	Per cent.	Negative.
6 to 9 days	12	0	0.0	12
1 to 6 years	22	11	50.0	11
7 to 14 "	148	114	75.0	34
15 to 20 "	69	63	86.0	6
21 to 30 "	137	123	87.0	14
31 to 40 "	56	52	87.0	4
41 to 76 "	16	13	81.0	3
	460	376	81.7	84

Engel and Bauer²³ also report their results in 280 children, positive cutaneous reactions occurring with progressive frequency as age advances, and varying from 13 per cent. in boys and 20 per cent. in girls, in the fourth year of life, to 56 per cent. in boys and 50 per cent. in girls between thirteen and fourteen years of age.

The relation of the percentage of positive reactions to the general frequency of infection, as revealed by autopsy, thus appears to be fairly constant. For more reliable evidence we require statistics of autopsy findings in cases which have been tested. Of such statistics I have found but comparatively little in literature, but have been able to collect 77 cases in which the conjunctival test was applied and in which the positive or negative results were confirmed in 70, or 83.33 per cent. If we exclude 5 cases in which, after negative result, autopsy revealed only obsolete tuberculous foci, and in which the reaction might not be expected to occur, the test proved reliable in over 88 per cent. of the cases. Of cases tested by the cutaneous method, I have found records of 214 which came to autopsy, in 184, or 85.98 per cent., of which the results were thereby confirmed. Finally, of 54 cases tested by subcutaneous injection, the results were proved in all.

Autopsy controls for the conjunctival method have been reported by Wolff-Eisner, Morelli,²⁴ Blum and Schlippe,²⁵ Damask, Massary and Weil,²⁶ Comby,²⁷ Bourget,²⁸ Raviart,²⁹ Hirsehler,³⁰ Fritz Levy, Marie and Bourilhac,³¹ Fehsenfeld,³² and Goerlich,³³ for the cutaneous method by Aronade,³⁴ Massini,³⁵ Engel and Bauer, Regli,³⁶ Lemaire,³⁷ Gruener,³⁸ v. Pirquet, and Ziesche,³⁹ and for the subcutaneous method, by Mettetal,⁴⁰ Franee,⁵¹ Mikulicz,⁶² and Diehl.⁵³

²³ Berl. klin. Woch., 1907, xlii, 1169.

²⁴ Wien. klin. Woch., 1908, xxi, 83.

²⁵ Münch. med. Woch., 1908, iv, 60.

²⁶ Wien. med. Presse, 1907, xlvi, 1765.

²⁷ Bull. d. l. soc. méd. d. hôp., November, 1907 (cf. Blum und Schlippe, I. c.).

²⁸ Soc. méd. des hôp., July 19, 1907 (cf. Dembinsky, Ztschr. f. Tuberkulose, 1908, xii, 138).

²⁹ Rev. méd. d. l. Suisse romande, 1907, p. 88 (cf. Blum und Schlippe, I. c.).

³⁰ Wien. med. Presse, 1907, xlvi, 1765.

³¹ Comp.-rend. soc. d. biol., 1907, lxiii, 506.

³² Ibid., 1379.

³³ Comp.-rend. soc. d. biol., 1907, lxiii, 281.

³⁴ Münch. med. Woch., 1908, iv, 1373.

³⁵ Ibid., 1379.

³⁶ Med. Klinik, 1907, iii, 51 (cf. Wolff-Eisner, Beitr. z. Klin. d. Tub., 1908, ix, 64).

³⁷ Correspondenzblatt f. Schweiz. Aerzte, 1908, xxxviii, 359.

³⁸ Ibid., 361.

³⁹ Rev. d. l. tuberculose, n. s., 1908, v, 199.

⁴⁰ Wien. klin. Woch., 1908, xxi, 986.

⁴¹ Berl. klin. Woch., 1908, xlvi, 1168.

⁴² Thèse de Paris, 1900.

⁴³ Transactions of the British Congress on Tuberculosis, 1901, London, 1902, iii, 106.

⁴⁴ Deut. med. Woch., 1891, xvii, 373.

⁴⁵ Diss. Freiburg im Breisgau, 1892.

The significance of tuberculin reactions has also been questioned, because, as shown by Matthes,⁵⁴ Freymuth,⁵⁵ Cabot,⁵⁶ and others, subcutaneous injection of peptones, albumoses, and the like induced fever and other constitutional phenomena in tuberculous and in non-tuberculous persons similar to those occasioned by tuberculin. It is to be observed, however, that such effects follow only the injection of doses much larger than those in which tuberculin is active, and, moreover, and this is of determining importance, such substances have not the selective action upon tuberculous tissue peculiar to tuberculin. In the earlier period of tuberculin therapy tuberculous patients at the Winyah Sanitarium were frequently injected with unplanted glycerin-bouillon solutions, and while fever often resulted, no focal reaction was ever observed in visible tuberculous affections of mucous membranes, nor in the lungs so far as could be determined by auscultation.

On the other hand, focal reaction has been observed to follow diagnostic injections of tuberculin with such frequency, in our experience at the Winyah, that we have long considered this as of much greater diagnostic import than the general symptoms of fever, malaise, etc. Among 23 cases with positive reaction to diagnostic injection of tuberculin, given in the Institution in 1903 and 1904, focal reaction was unmistakable in 21. In the other two the previous presence of moist rales made differentiation of the local phenomena doubtful. The significance of focal reactions to tuberculin has also been pointed out by Neisser,⁵⁷ Maragliano,⁵⁸ Schwalbe,⁵⁹ and others.

In the production of fever reactions in the tuberculous, also by subcutaneous injection of bacterial proteids other than those derived from the tubercle bacillus, as shown, for example, by Feistmantel⁶⁰ with *Streptothrix farcinia*, by Klempner,⁶¹ and by Buchner and Roemer with proteins of *Bacillus pyocyaneus*, there is nothing surprising if the dosage is sufficient; and, as Feistmantel himself says, there is nothing which acts in its injection in minimal doses upon the tuberculous organism as does tuberculin.

The work of Irimescu⁶² with paratuberculin prepared from Moeller's Timothy bacillus for conjunctival test (alcoholic precipitate), with which he obtained 44 positive reactions to first instillations out of 45 surely tuberculous cases, is to be accepted rather as evidence of the specific nature of the test than otherwise, since it illustrates the principle of group reaction. Neither does Irimescu

⁵⁴ Deut. Arch. f. klin. Med., 1894, liv, 39.

⁵⁵ Diss. Erlangen, 1898.

⁵⁶ Journal of the Boston Society of the Medical Science, January, 1899.

⁵⁷ Klin. Jahrb. Ergänzungsband, Berlin, 1891, p. 418.

⁵⁸ Riforma medica, 1891 (cf. Münch. med. Woch., 1891, xxxviii, 149).

⁵⁹ Berliner Klinik, January, 1891, No. 31.

⁶⁰ Centralbl. f. Bakt., 1904, xxxvi, 282.

⁶¹ Ztschr. f. klin. Med., 1892, xx, 165.

⁶² Revist. Stiintel. med., 1907, Nos. 7 and 8 (cf. Centralbl. f. inn. Med., 1908, xxix, 87).

interpret his observations as showing more than the close relationship existing between tuberculins and paratuberculins.

Finally, Fernand Arloing⁶³ believes he has supplied positive proof of the non-specific nature of the reaction. Two horses which had been used to obtain antidiphtheritic serum reacted positively, as did also two horses treated with tetanus toxin, while in untreated horses the reaction was negative, but appeared after five weeks of antidiphtheritic immunization. This author's results lack confirmation, and in controversy thereto, Calmette and Guérin⁶⁴ report entirely negative results in 23 horses, 8 of which were immunized against diphtheria, 8 against tetanus, and 7 were non-immune. By the cutaneous method Entz⁶⁵ has obtained reactions in tuberculous adults and children to toxins other than tuberculin, as diphtheria, pyocyanus and paratyphoid, in about 50 per cent. of cases.

To his denial, based upon these results, of the specific nature of the tuberculin test von Pirquet replies that, on the one hand, it has been shown for some toxins (mallein, leprolin, vaccin, tuberculin) that the organism will only then react to them if there has been a previous infection with the reciprocal microorganism; that, on the other hand, with other toxins (tetanus, diphtheria) such a previous infection ("acquaintance") is not necessary or essential to the reaction. These facts, he says, do not invalidate the specific nature of the cutaneous tuberculin test.

That non-specific protein substances are incapable of causing conjunctival reactions, Roepke ascertained in 25 tuberculous patients by instilling a 5 per cent. solution of glycerin bouillon which had first been condensed to one-tenth of its volume and then diluted. No effect was produced. I have also instilled a control preparation consisting of a 1 per cent. solution of the alcoholic precipitate of concentrated glycerin-bouillon into the conjunctival sac in 15 cases, 8 of which had previously given positive reactions to tuberculin, the same eye being used, without in a single instance observing the slightest influence, either general or local.

On the other hand, I have observed in several early cases of apex localization a focal reaction to occur simultaneously with the conjunctival reaction; the stethoscopic signs became distinctly intensified, and crepitation was heard where it had before been absent. Roe⁶⁶ also reports a case tested by the conjunctival method in which the occurrence of focal reaction in the lung cleared up the diagnosis, which had before been doubtful.

This would indicate that the tuberculous focus is concerned in the reaction. I cannot believe, therefore, that the latter depends upon the local formation of antibodies alone. With the minimal doses in which tuberculin is thus applied, 1 to 4 mg. (exceptionally),

⁶³ Comp.-rend. soc. d. biol., 1908, lxiv, 722.
⁶⁴ Wien. klin. Woch., 1908, xxi, 379.

⁶⁵ Ibid., 889.
⁶⁶ Brit. Med. Jour., 1908, i, 443.

according to the strength of solution employed, part of which is, moreover, often not even retained in the conjunctival sac, it is not conceivable that enough would be absorbed into the circulation to produce manifest and recognizable focal reaction in a majority of cases, as is so frequently observed after subcutaneous injection of tuberculin.

Further than this, for lack of space, I must refrain from entering into a consideration of the various theories which have been advanced in explanation of the conjunctival and cutaneous reaction, and of the divergent comparative results therewith obtained. So far as I can judge, none has as yet been formulated which satisfactorily meets all requirements and is entirely free from objection.

Among the specific aids in the diagnosis and prognosis of tuberculosis I have still to consider the serum reactions, and more particularly the agglutination reaction of Arloing and Courmont, with which my own experience is more extensive.

As regards the value of these methods, there still prevails a wide diversity of opinion. It was not long after Arloing and Courmont's first publication before the diagnostic significance which they claimed for the sero-agglutination of tubercle bacilli was disputed by other observers, because it was found that not only was the reaction inconstant in tuberculosis, but that it occurred occasionally in other affections, notably typhoid fever, and with the serum of healthy individuals.

Such experiences have caused many to deny that the test has any diagnostic value whatever, among whom may be cited Eisenberg and Keller⁶⁷ who noted but 13 per cent. more positive reactions in tuberculous than in non-tuberculous persons; also Dieudonné,⁶⁸ Beck and Rabinowitsch,⁶⁹ v. Gcbhard and v. Torday,⁷⁰ de Grazia,⁷¹ and lastly Wright and Douglas,⁷² who state that the demonstration of the agglutinating power of serum affords no information of the presence or absence of tuberculosis.

Ferré,⁷³ Kinghorn,⁷⁴ Bendix,⁷⁵ Bandelier, and others find that in advanced cases of tuberculosis the reaction is often absent or is less pronounced.

Rumpf and Guinard⁷⁶ found the reaction positive in 84 per cent. of 107 cases, and Carrière⁷⁷ in 75 per cent. of second- and third-stage cases of phthisis. Berthelon⁷⁸ obtained 96 per cent. of positive results in pulmonary tuberculosis, many sera reacting in dilutions

⁶⁷ Centralbl. f. Bakt., 1903, xxxiii, 549.

⁶⁸ Deut. Militärärztl. Ztschr., 1900, No. 10.

⁶⁹ Transactions of the British Congress on Tuberculosis, 1901, London, 1902, iii, 153.

⁷⁰ Münch. med. Woch., 1902, xlix, 1171. ⁷¹ Berl. klin. Woch., 1902, xxxix, 229.

⁷² Lancet, 1904, ii, 1138.

⁷³ Ann. d. méd. et chir. infant., 1906, x, 648.

⁷⁵ Deut. med. Woch., 1900, xxiv, 224.

⁷⁴ Medical News, 1905, lxxxvii, 647.

⁷⁶ Deut. med. Woch., 1902, xxviii, 131.

⁷⁷ Comp.-rend. soc. d. biol., 1901, liii, 746.

⁷⁸ Congrès internat. d. l. tuberc., 1905, Paris, 1906, I, 359.

of 1 to 15, 1 to 20, and even some as high as 1 to 50. Hawthorn⁷⁹ reports 54 positive reactions out of 57 cases, and failed to obtain positive results in healthy individuals, although, in his experience, the reaction occurred in other diseases. Romberg⁸⁰ found no agglutination in 33 newborn infants, nor did Descois,⁸¹ whether the mothers were tuberculous or not. Rosenberger⁸² obtained complete reaction in dilutions of 1 to 1 in three, and of 1 to 3 in one, or in a total of 4 out of 39 newborn infants.

At the Winyah Sanitarium I have studied the subject for several years, applying the test on admission, and at intervals during treatment with specific remedies. Observations in 300 tuberculous cases which are complete show the following results:

	Cases.
On admission the test was negative in	20
Agglutination occurred in dilution of 1 to 5 in	49
" " " 1 to 10 in	86
" " " 1 to 15 in	21
" " " 1 to 20 in	50
" " " 1 to 25 in	57
" " " 1 to 30 in	7
" " " 1 to 40 in	4
" " " 1 to 50 in	6

In the same cases, on discharge the results were as follows: In 288 cases an increase of agglutinating power was observed under treatment with watery extract of tubercle bacilli. The serum of 63 agglutinated in dilutions of over 1 to 25, and not exceeding 1 to 100. Of these, 6 (or 9.35 per cent.) were apparently cured; the disease was arrested in 22, or 34.92 per cent.; improved in 27, or 42.85 per cent.; stationary in 6, or 9.35 per cent.; and had become worse in 2, or 7.4 per cent. The serum of 107 agglutinated in dilutions of over 1 to 100 and not exceeding 1 to 200. Of these, 41 (or 38.32 per cent.) were apparently cured; the disease was arrested in 51, or 47.66 per cent.; improved in 14, or 13.08 per cent.; stationary in 1, or 0.94 per cent.; and had grown worse in none. The serum of 90 agglutinated in dilutions over 1 to 200 and not exceeding 1 to 300. Of these, 73 (or 81.11 per cent.) were apparently cured; the disease was arrested in 15, or 16.76 per cent.; improved in 2, or 2.22 per cent.; stationary in none; had grown worse in none. The serum of 28 agglutinated in dilutions over 1 to 300 and not exceeding 1 to 500. Of these, 25 (or 85.7 per cent.) were apparently cured; the disease was arrested in the remaining 3, or 14.3 per cent. In the additional 12 cases a decline in agglutinating power was noted in 8, and a total loss in 4; all the 12 patients grew worse or died.

These observations are quite in accord with the experience of others. In 20 of our cases in which the diagnosis could be otherwise

79 *Gaz. hebdom. d. méd. et d. chir.*, 1902, vii, 547.

⁸⁰ Münch. med. Woch., 1902, xlix, 89.

⁸¹ Jour. d. physiol. et d. path. gén., 1903, v, 127.

⁸² Zentralbl. f. inn. Med., 1904, xxv, 665.

established no agglutinating power was present, while in 49 it did not exceed a dilution of 1 to 5. Again, in far advanced progressive cases the reaction either disappeared entirely or became progressively diminished.

Arloing and Courmont⁸³ subsequently to their earlier publications, decided that agglutination in dilutions below 1 to 5 should not be accepted as diagnostic, since the reaction was often present in healthy persons in such slight degree. My own experience would confirm me in the opinion that, in the absence of other definite evidence upon which to base a diagnosis, we should require a positive reaction in dilutions of not less than 1 to 10; this, because I have frequently observed reaction in lower dilutions in persons in whom suspicion of tuberculosis did not exist. With this qualification, of the 300 cases examined, 231, or 77 per cent., agglutinated in dilutions of 1 to 10 or higher, and in all the diagnosis was either sufficiently evident or could be determined by other means. In cases in which there is no sputum, or in which tubercle bacilli are absent, and in which the subjective symptoms and physical signs denote apex infiltration or catarrh, I have learned to depend upon the reaction when present in the higher dilutions as of positive determining value, and in such cases the tuberculin test may be dispensed with, its results in my experience always having confirmed those of the serum test.

The occurrence of agglutination in slight degrees in health does not detract from the value of the method in clinical practice. The facts that the reaction is frequently absent in the early period of the disease, that it is rarely missed when the disease is more developed, and is again diminished or lost toward the end, show that agglutinins form in the course of tuberculosis, as in other infectious diseases, in response to the absorption into the blood of specific toxins. The amount of agglutinins varies materially with the amount of specific toxins absorbed and the corresponding degree of response on the part of the organism. Hence it is that in the more developed disease we find the reaction most constantly present when the general condition and general resistance are still good. When these are greatly diminished in rapidly progressive cases the ability to respond is likewise lessened and the agglutinating power in consequence declines or is entirely lost.

The occurrence of the reaction in many healthy persons and in those affected with other diseases may be interpreted by assuming that latent foci exist in those who show slight degrees of agglutinating power, and in consequence of which they have acquired it.

The fact that the sera of newborn children are practically always negative, associated with the extreme rarity of congenital tuberculosis on the one hand, and on the other the great frequency with

⁸³ Congrès internat. d. l. tuberculose, 1905, Paris, 1906, I, 332.

which latent and healed tuberculous foci are revealed at autopsy on the clinically non-tuberculous, renders more than probable the truth of such an explanation.

The greater comparative frequency with which the reaction occurs in cases of typhoid fever appears to bear an analogy to the recorded experiences with the tuberculin test in such patients. Thus, in a total of 70 typhoid fever cases, in which tuberculin was instilled into the conjunctival sac by various observers, positive reactions occurred in 20 or 28.37 per cent., as detailed below.

CONJUNCTIVAL TUBERCULIN TEST IN TYPHOID FEVER.

Author.	Cases.	Positive.	Negative	Preparation; Remarks.
Blum	18	4	14	9 had fever. Calmette's formula.
Austin and Gruenbaum ⁸¹	8	0	8	Calmette's formula.
Clark ⁸²	14	7	7	T. old 0.5%.
Colin, Sigism	11	6	5	T. old 1.0%. 1 positive case was paratyphoid; 4 afebrile.
Levy, Fritz	3	1	2	T. old. Hoechst. Convalescence.
Stadelmann and Wolff-Eisner	8	0	8	All negative to cutaneous.
Tice ⁸³	7	1	6	Tablet form.
Bourget	1	1	0	Autopsy negative as to tubercu-losis.
	70	20	50	
		28.37%		

Again, according to Arloing and Courmont, typhoid fever patients show agglutinating power for the tubercle bacillus in 75 per cent. of cases.

From this Calmette and Guérin infer that the Eberth bacillus forms agglutinins which are capable of agglutinating both kinds of bacilli, but Arloing and Courmont claim that this occurrence is not due to the identity of the two agglutinins, nor to a parallel method of production. The serum of an animal, they say, may acquire a high agglutinating power for the Eberth bacillus after inoculation with this bacillus, without exhibiting the like characteristic for Koch's bacillus.

This question is an interesting one, and engaged my attention some ten years ago in a comparative study of the agglutinating power of the blood sera of normal individuals and of tuberculous patients in relation to the Eberth bacillus. In my own experiments I used for control serum from typical cases of typhoid fever, which was found to agglutinate completely the Eberth bacillus in dilutions of 1 to 10 in fifteen minutes. The sera of normal persons who had never had typhoid fever, and who

⁸¹ Brit. Med. Jour., 1907, ii, 1907.

⁸² Jour. Amer. Med. Assoc., 1908, 1, 2061.

⁸³ Ibid., 1982.

were free from all suspicion of tuberculosis, showed no tendency to agglutinate the Eberth bacillus even after one hour. As compared with the normal and with typhoid sera, the sera of tuberculous patients with no history of typhoid fever showed beginning agglutination of Eberth's bacillus in fifteen minutes and well marked agglutination in thirty minutes in the same dilution.

The only explanation for these observations, and one which may be applied with as much reason to account for tuberculin reactions in typhoid fever patients in greater frequency than these occur in healthy persons, appears to lie in that of group reaction, even though the Eberth bacillus seemingly presents nothing in common with the acid-proof bacteria. However that may be, no definite conclusions are warranted.

In this consideration of specific aids in the diagnosis and prognosis of tuberculosis I have endeavored to show the comparative value of the various resources at hand.

The specific nature and value of tuberculin as a diagnostic agent does not appear to be refuted by the objections which have been raised against it. The minimal amounts in which it is active, the negative results obtained by all three methods of applying it in the newborn, the increasing comparative frequency of positive reactions with advancing age in their approximate harmony with autopsy findings in the clinically non-tuberculous as well as the tuberculous, the occurrence of focal reactions following subcutaneous injection and conjunctival instillation, all testify to its reliability.

To demand that either positive or negative results be confirmed with mathematical accuracy by actual autopsy findings would be unreasonable; nor has clinical medicine progressed to such a degree of precision in other respects.

As much may be said for the serum reactions. As for the various contradictions which have apparently arisen with regard to all the diagnostic measures which have been considered, and which are at present not explained, these are problems which may yet be solved in the future.

In clinical practice the occasion can seldom arise to enter so deeply into such questions. Persons who are in good health do not often consult a physician, nor would any but the most unconservative base a diagnosis upon a single isolated bit of evidence. In non-bacillary cases suspected of tuberculosis, when physical examination reveals abnormal conditions suggestive of the presence of a tuberculous affection, the tuberculin test as well as the serum reaction, or both, may safely be depended upon for confirmation in the vast majority of instances. One may be employed to supplement the other, and thus, taking all things into consideration, the patient is not likely to be placed at a disadvantage for want of a diagnosis.

SOME ASPECTS OF CALCULOUS ANURIA.

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THERE are certain factors connected with the condition of calculous anuria concerning which there is a general agreement among surgeons and pathologists; these I shall merely enumerate. There are others which have either received but relatively slight attention or concerning which there is a difference of opinion; it is with some of the latter only that this communication is concerned.

The following belong to the first of these two classes:

1. In the majority of the cases of unilateral calculous anuria the unobstructed kidney is either destroyed, functionally useless, or there is a congenital absence of the organ on the side opposite that of the obstructed kidney.

2. The average time of the period of tolerance, so-called, that is the time which elapses between the beginning of the anuria and the appearance of uremic symptoms, is from five to seven days. The number of days before death occurs after the appearance of uremic manifestations is variable; so, too, is the length of time between the beginning of the anuria and death. Twenty-three days have been reported to have intervened between these times in one instance, and there are a number of cases in which death has not taken place before the sixteenth day.

3. The mortality in the cases of patients treated palliatively is very great (between 70 and 80 per cent.); that of those treated surgically is about one-half as great.

4. The nearer the beginning of the anuria the surgical treatment is applied, the smaller is the mortality attending the operations and the larger the number of patients who recover. It is, however, true that the presence of uremic manifestations, and the fact that the period of anuria has been very long, do not constitute contraindications to operation; nor is surgical treatment necessarily hopeless under these conditions.

5. Surgical intervention should not be delayed more than forty-eight hours, and in some cases the delay should be less.

6. Absence of uremic manifestations and an apparently good condition of the patient do not excuse a longer delay than this in applying surgical treatment.

7. The essential indications to be fulfilled in the surgical treatment are to supply a free avenue of escape for the urine from the kidneys, and, if the patient's condition permits, to remove the calculus.

8. The first kidney to be operated upon should be the one which is believed to be the less damaged of the two.

9. The quietest and most effectual way of restoring the sup-

pressed urinary function of an obstructed kidney is by a rapidly performed lumbar nephrotomy and drainage of the organ for a time at least afterward.

The factors of the second class spoken of are as follows:

1. *The reno-renal reflex inhibition of the function of an unobstructed kidney produced by the sudden obstruction of the ureter of the kidney of the opposite side.*

It is frequently denied that this phenomenon can occur when the unobstructed kidney is normal, but that it may do so appears to be established by the clinical observations reported by Imbert, Israel, Kreps, Rovsing, and Broe, and by one postmortem examination reported by Legueu. It is undoubtedly very rarely that such an inhibition occurs in the unobstructed normal kidney, but what is not sufficiently remembered, although almost equally important, is the undoubted fact that the function of an unobstructed and more or less diseased or damaged kidney, which, however, retains a useful degree of functional capability, is frequently inhibited by what we call a reno-renal reflex. Moreover, there is a certain number of cases in which both kidneys retain a useful degree of functional activity, and in which the united work of both will be required to maintain the life of the patient, and in which neither one alone is capable of doing so. For these reasons we may not rely upon the oft-repeated dictum of Legueu with reference to ealeulous anuria: "Anuria does not occur except in patients who live with one kidney only."

The two following cases are of interest in connection with the question of the reno-renal reflex inhibition of the unobstructed kidney, and illustrate some of the points that have just been spoken of. The first was a case reported by Ransohoff, in which anuria was not present at the time the patient was subjected to a right-sided nephrolithotomy. The kidney was the seat of a suppurative process, but was still capable, as it afterward proved, of performing a very essential and useful degree of functional work. It was drained. Both kidneys continued to secrete for the next month, the lumbar drainage from the kidney already operated upon being maintained during the whole of this time. At the end of a month the other kidney became obstructed and anuria occurred. At the end of the third day of the anuria the second kidney was laid open. It was pyonephrotic, but still capable of performing useful functional work. This kidney was likewise drained. Both kidneys at once resumed their function. The first kidney operated upon performed two-thirds, and the second kidney one-third, of the total functional work of secretion. The two organs were permanently drained through the loins. The patient was in good condition at the time at which the report was made, three years after the second operation.

The second case is one personally communicated to me by Dr. Hugh Cabot. Anuria was not present at the time of the performance

of a unilateral nephrolithotomy. The kidney was drained through the loin, when, on the fourth day after the operation, anuria occurred. Dr. Cabot promptly cut down upon the second kidney and removed an obstructing calculus from its ureter. Both kidneys resumed their secretory function; the wounds healed in due course, the patient recovered, and was in excellent health eight months after the second operation. Neither kidney was normal in this case, but both were capable in a useful degree.

In this case, as in the first, there seems to be no way of explaining the suppression of the function of the kidney first operated upon except by assuming that it was produced by a reno-renal reflex inhibitory influence proceeding from the sudden obstruction of the ureter of the opposite kidney. The chiefly interesting point in both of these cases is that the suppression of function should have occurred at the moment when the kidney of the side first operated upon was draining freely through the loin. Another point to be noted is that the united work of both kidneys was required to sustain life in both of these cases, and that both kidneys in both cases were in a useful degree functionally capable, although neither of them was normal. It may be questioned whether the inhibitory influence was of the nature of a reno-renal reflex, but it cannot be doubted that whatever its nature may have been, it was, at any rate, such that the arrested renal function was set free again by virtue of providing an outlet for the escape of urine directly from the obstructed organ, and the patients' lives were thereby saved. This last fact is the one to be borne in mind from the standpoint of the practical surgeon, and it is that which should determine prompt action on his part in these cases.

2. The differences which may exist between the renal conditions seen upon postmortem examination of the kidneys and those which may have been present at the beginning of the anuria, and the impossibility of asserting positively just what degree of structural change in a kidney necessarily renders it wholly incapable of further functional work.

With regard to this point, it need only to be recalled that the changes of a destructive nature in the secreting elements of a kidney which is wholly obstructed, progress rapidly, and that it is not necessarily true that the renal conditions which at the time of postmortem examination may be such as to suggest that the kidneys could no longer be capable of useful functional activity were necessarily incapable at the time of the beginning of the attack of anuria. Equally is it impossible—except in the examples of extreme destruction of the kidneys—to state positively just what degree of destruction of renal substance must necessarily deprive a kidney of any further functional activity of a useful character. Most surgeons have operated upon kidneys in which there has been so small a layer of renal secreting substance as to make it

seem impossible that the organ should be capable of performing any useful degree of functional work, and yet in some of these cases the operator has been surprised to find that the patient not only continues to live, but may even enjoy a long period of good health. In such a case as this it is very possible that the conditions which were present at the beginning of the attack of anuria would have been such as to have allowed the patient to live had there been supplied a free escape for the urine from the kidney shortly after the attack began, and yet at the time of death, at the end of a considerable period of anuria, the kidney may present such conditions as to make restoration of functional activity impossible—at any rate, to the point of maintaining the patient's life. The practical lessons to be learned from these things is that the surgeon should operate early in the course of the anuria, and that he should be wary of assuming that a kidney, even when it possesses but a very small amount of renal secreting substance, is necessarily useless.

3. The advantages that may sometimes be derived from simultaneous bilateral nephrotomy or nephrolithotomy in calculous anuria.

The patient with calculous anuria needs most urgently to have all the capable renal substance of which he is possessed set at liberty to become again active if he is to be given the best chance of having his life saved. If the statement which has been quoted from Legueu, "Anuria does not occur except in patients who live with one kidney only," is true, it is obvious that it would be useless ever to incise the second kidney at, or soon after, the time of incising its fellow of the other side (unless it be in the cases in which the mistake has been made of laying open the wrong—useless—kidney in the first instance), for we should not be accomplishing any good whatever. If, on the contrary, there are cases in which both kidneys possess a useful degree of functional activity, and if, furthermore, the functional work of one of them alone is insufficient to sustain life, and if, on the other hand, it is capable of being maintained by the combined action of such renal substance as may be present and still capable in both kidneys, it is equally clear that in all the instances in which these things are true we shall not be giving the patient his best chance of life if we arrest our intervention with a unilateral operation, and that we should proceed to incise both kidneys at one and the same sitting.

It is for this reason that I urge that simultaneous bilateral nephrotomy or nephrolithotomy be done in some of these cases. Those in which I think this procedure is appropriate are the following: (1) All cases in which, upon cutting down upon the first kidney, it is found that there is not enough renal substance remaining to make it probable that the organ will be capable of sustaining life by the exercise of its function alone. The inference should always be that the greater the destruction in the kidney first operated upon,

the greater the probability that the kidney of the other side has a useful amount of renal secreting substance in it, and correspondingly greater becomes the importance of immediately incising that kidney, in order that the patient may have the benefit at once of all the functionally capable renal substance that he possesses. (2) All cases in which there is a simultaneous blocking of the ureters of both kidneys, or in which there is one ureter blocked and a calculus in the other kidney, it being always possible and fairly probable that the calculus in the second kidney, even though it is not at the moment blocking the ureter, may do so at any time subsequently.

The frequency with which calculous disease is bilateral may be judged from the 230 cases of renal calculus made up of the separate series published by Albaran, Morris, Legnen, Kraft, and Kümmel: in 30 per cent. of these, calculi were present in both kidneys. In another series of cases that I collected, numbering 187, there were 52 (27.8 per cent.) of bilateral calculus, and in 29 of these there was simultaneous blocking of the two ureters. It is in the latter class that there is the greatest likelihood of capable renal substance being present in both kidneys.

The x-ray examination and radiography are, of course, our best means of determining the presence of a calculus in the kidneys or ureters; but in this special class of cases the patient is very critically ill—which makes such an examination difficult; an expert in making radiograms may not be available, and it may not be justifiable to delay to have such an examination made; consequently, we are frequently deprived of the assistance that we should otherwise have from it. This is often true also of the employment of the ureteral catheter. There may be, however, a great advantage derived from passing the ureteral catheters into the ureters, not merely for the purpose of detecting the presence of a calculus, but also to relieve—at least temporarily—the anuria, by passing the instrument beyond the stone, and thus overcoming the obstacle to the free escape of urine from the kidney. When this is successful the surgeon is given a better chance for removing the calculus subsequently under more favorable conditions than those which he faced at the outset. The ureteral catheter, however, should not be relied upon to secure permanent relief from the danger of anuria.

Returning to the consideration of the advantages of simultaneous bilateral nephrotomy or nephrolithotomy in some of the cases of calculous anuria, I would say that I have found but 6 cases in the literature in which this operation has been done in this class of cases. These are as follows: Lange, Turner, Macmunn, Moschkowitz, Watson, and Babcock. The patients of Lange, Moschkowitz, and Babcock lived; the other 3 died. It is, however, to be noted that in the cases of Turner and Watson the deaths were due to sepsis rather than to a failure of restoration of renal function.

Reference and name of reporter.	Duration of anuria and uremia.	Operation and result.	Condition of kidneys.
Lange (Med. News, January 16, 1886, p. 96).	Anuria 24 hours.	Simultaneous bilateral operation. First kidney incised was hydronephrotic and functionally useless. Callelius, all useless. The second one contained a calculus removed from second kidney; the latter was, and was capable. Recovery.	First kidney incised was hydronephrotic and functionally useless. The second one contained a calculus removed from second kidney; the latter was, and was capable. Recovery.
Ransohoff (Jour. Amer. Med. Assoc., 1895, xxv, 1).	Anuria not present at time of first operation; 3 days before the second.	Bilateral nephrotomy. Stone removed from first kidney. None in second, but a collection of pus was evacuated. Both kidneys drained permanently. Patient in good condition 3 years after operations. One month's interval occurred between the two operations.	Both kidneys pyonephrotic. Both ureters obstructed from both kidneys. Both kidneys obstructed from both kidneys. Both kidneys obstructed from both kidneys.
Albarran (from <i>Huck's Thesis</i>). Anuria present; duration not stated. Nancy, 1904.		Unobstructed kidney drained for 24 days; it then constricted and enlarged. The second one, which was obstructed, was not operated upon, had callelius obstructing ureter.	First or unobstructed kidney was merely obstructed by callelii. The second one, which was obstructed, was not operated upon, had callelius obstructing ureter.
Stevens (from <i>Huck's Thesis</i>). Anuria 8 days; uremia none.		No operation. Death.	Both ureters obstructed by callelii. One kidney nearly normal. The other had some functionally capable substance.
Vitrac (from <i>Huck's Thesis</i>). Anuria 9 days.		Unilateral nephrotomy. Death 4th day from uremia.	Both ureters blocked by callelii. Both kidneys had a good deal of capable secreting substance.
Brück (from <i>Huck's Thesis</i>). Anuria 8 days. Uremia not noted.		Unilateral nephrotomy. Death 2d day.	Same as in preceding case.
Huek (Thesis).	Anuria 10 days.	Unilateral nephrotomy. Death 7th day from uremia.	Both kidneys had useful amount of capable renal substance. Both ureters blocked by callelii.
Babeck (Ann. Surg., April, 1908).	Anuria 24 hours. No uremia.	Simultaneous bilateral nephrolithotomy. Recovery.	Both kidneys functionally blocked. Both kidneys functionally capable. One of them had moderate hydronephrosis.
Thomas (Rev. med. la. Suisse Anuria 15 days; two slight remissions. Rom., 1906, xxvi, 639).		The same operation had been done 3 years before. Unilateral nephrotomy 15th day of anuria. Both kidneys had a useful amount of capable secreting substance. Both had moderate degree of interstitial nephritis. Recent infarctions in kidney not operated upon. Both ureters blocked.	One of them had moderate hydronephrosis. Both kidneys functionally blocked. Both kidneys functionally capable. One of them had moderate hydronephrosis.
Doering (Deut. Ztsch. f. Chir., 1907, lxxxi, 66. Doering (i-id.).	Anuria 8 days. Uremia unnoticed.	No operation. Death 3 days later.	Both ureters blocked. Both kidneys functionally blocked. Both kidneys functionally capable.
Moschikowitz (New Yorker Med. Monatsschr., 1904, xvi, 401).	Anuria 10 days. Uremia unnoticed.	Unilateral operation begun, but not completed. Death.	Both kidneys functionally blocked. Both ureters blocked. Both kidneys functionally capable.
Addy (Marit. Med. News, Halifax 1903, xv, 374).	Anuria 26 hours.	Simultaneous bilateral nephrolithotomy. Recovery.	Both kidneys functionally blocked. Both ureters blocked by callelii.
Watson (Ann. Surg., September, 1907).	Anuria 3 days. Uremia 36 hours.	Death due chiefly to sepsis. Same as in last case. Death on 11th day, due to sepsis chiefly.	Death due to sepsis. Same as in last case. Death on 11th day, due to sepsis chiefly.
Turner (Trans. Clin. London, 1891, xxv, 15). MacMunn (Quoted by Morris, Anuria, uremia, both unnoticed. Renal Surgery, 1898, p. 287).	Anuria 24 hours. Uremia same.	Same operation. Death 5th day.	Both kidneys functionally capable. This case is one in which the fact of finding the first kidney upon incapable should, as it did, lead to the immediate incising of the other one, but in this special instance the combined work of both was not enough to save the patient.

The indications for the simultaneous bilateral operation in unilateral cases of calculus have already been stated. It would not be appropriate to do this operation in any case in which the surgeon judged that the first kidney operated upon would probably be capable, by its own unaided work, of sustaining the life of the patient, but only when the contrary is true.

The additional shock involved in the operation upon the second kidney, when it is done at the same time as the operation upon the first, is but little greater than that of the unilateral operation, so far as we may judge from my experience up to the present time. Both organs can be incised and drained very quickly, unless there are unusually difficult conditions present, such as adhesions, that necessitate a longer and slower procedure. It is true that any surgical intervention of magnitude, such as nephrotomy, carries with it a very considerable danger to life when it is undertaken under conditions such as those under consideration; but the condition, left to itself or but partially relieved, is far more dangerous than the complete operation is ever likely to be in the cases in which I have suggested the employment of the bilateral procedure.

The appended table of 16 cases is taken from the whole number of 33 in the series of 187 cases which I collected, and in which I believe that the renal conditions were such as would have made the simultaneous bilateral operation better than the unilateral one. The latter was practised in all but 6 of the cases (those already referred to); in 4 others a bilateral operation was done, with an interval between the two procedures. These 4 cases were those of Cabot, Kümmel, and Ransohoff. All these patients lived; in none of them was there a simultaneous blocking of the two ureters, while in the other 6 it was present. The renal conditions were also more favorable in the 4 than in the 6 patients. In no single instance in which a unilateral operation alone was done, did the patient live.

THE IMPORTANCE OF MODIFICATIONS OF THE SENSIBILITY IN THE DIAGNOSIS OF DISEASE.

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MANY of the difficulties in the examination of the sensibility were inherent in the imperfect methods due to a former want of knowledge of the different modalities of this function. These have been solved by the researches of Head¹ and his colleagues,

¹ Brain, 1905, xxviii, 99, 115.

who have shown that there are three distinct and different modes in the periphery. These are not, as it was formerly thought, touch, temperature, and pain, but consist of:

1. *Deep Sensibility.* The fibers subserving this originate in the muscle spindles and analogous bodies, and accompany motor nerves and those in tendon, joint, and connective tissue in general. They are stimulated by molar alteration of relative pressure and are expressed in terms of pressure and attitude. They are also susceptible to vibration, and when powerfully stimulated transmit painful impulses. Symptomatically, their involvement causes ataxia and partial astereognosis.

2. *Epicritic sensibility*, passing by the cutaneous nerves and conveying impressions of (a) light touch, (b) fine distinctions of coolness and warmth, (c) the appreciation of two or more spots touched simultaneously, along with localization.

3. *Protopathic sensibility*, by which one perceives only the extremes of heat and cold, and by which, although tactile and painful impressions are perceived, they seem vague and are badly localized, being often referred to other parts of the body or even to the exterior.

Head² believes that it is this form of sensation which is stimulated in visceral disease, and he lays stress upon the discomfort of an inexplicable kind which often accompanies stimulation of these fibers. It is manifested especially on hairy parts on lightly drawing a needle across a part retaining only protopathic sensations, and resembles the feeling of shivers many people experience upon hearing or feeling the rubbing of silk or the squeaking of a door. Of all our sensations, this is probably the least differentiated phylogenetically. Head thinks it is probably that part of the afferent arc which expresses itself efferently in the pilomotor, vasomotor, and secretomotor reflexes. This, unlike the epicritic system, does not contain specific end-organs for heat and for cold. Recent researches of Gordon Wilson³ indicate that it is the only system represented in the cutaneous tympanum, which contains no end organs and is insensitive to touch, coolness, and warmth.

This is the form of sensibility which Sherrington⁴ was investigating when he demonstrated the enormous overlapping of the distribution of cutaneous nerves. The areas of supply of epicritic nerve-groups do not encroach at all upon neighboring territory.

To Head's belief, however, Mackenzie⁵ cogently urges that viscera do not respond to any of the methods of stimulation which are effective in provoking protopathic sensations in the cutis. He inclines to believe that their sensations are autonomic, and ascribes our occasional consciousness of them to the erythema their stimulation

² Brain, 1905, xxviii, 116, 338.

³ Reports of the Hull Laboratory of the University of Chicago, 1907.

⁴ Schäfer's Text-book of Physiology, 1900.

⁵ Brit. Med. Jour., 1906, p. 1449.

causes in a metamere to which their sympathetic afferent nerve fibers run. The erythema thus induced is manifested when one stimulates other afferent neurones of this segment, as touching the skin or pinching the muscles subserved by it, or even by a general stimulus of the whole spinal cord, as when startled. The commotion thus caused, though having little general effect, yet activates as a match to powder any area at high tension. Familiar examples of this high tension are seen in rabies, tetanus, strychnine poisoning, and spastic paraplegia, all characterized by a very slight stimulus producing a very great reaction.

The most striking example of such erythema is afforded in angina peitoris, in which the visceral spasm leads to an erythema of the eighth cervical and first and second thoracic spinal segments, resulting in an irradiation of pain along their sensory distribution, and a hyperalgesia over the same part. A reflection of a purely autonomic kind may be produced in the same region by rubbing the skin of the mamma with flannel—when a peculiar creepy sensation runs from the chest down the inside of the arm. This is often accompanied by a pilomotor contraction in the same region and by a dilatation of the homolateral pupil, and occasionally by a similar sensation on the cheek. By means such as these we can effectually exclude suggestion in interpreting the sensations, and thus remove them from the domain of hysteria, already too greatly burdened.

While these are the modalities of the sensibility distinguishable in the periphery, the groupings are very different within the spinal cord, where all painful impulses run together heterolaterally in Gowers' tract, very closely accompanied by the impulses of cold and heat. The impulses derived from the position of the limbs of which we become conscious pass homolaterally in the posterior column, while those of which we are unconscious, but which regulate tonus and automatic involvement, pass toward the cerebellum homolaterally in the dorsal spinocerebellar tract and heterolaterally in the ventral spinocerebellar tract and in the tractus spinothalamicus et teitalis. The impulses for touch, here accompanied by pressure, also take two courses, a homolateral in the posterior column for a few segments only, and a heterolateral probably in the anterior column (Page May).⁶

METHODS OF INVESTIGATION IN PRACTICE. 1. *Epieritic Sense:* (a) By drawing soft cotton-wool over the skin; (b) by localization; (c) by a pair of compasses; (d) by test-tubes between 22° and 47° C.

2. *Protopathic Sense:* (a) By test-tubes nearer the freezing and the boiling points; (b) by the prick of a pin; (c) by an iron-coated faradie current.

3. *Deep Sensibility:* (a) By pressure on the part; (b) by altering the attitude of the limb and asking the patient to describe or imitate

the new position; (c) by the estimation of weights (muscular sense); (d) by the estimation of deep pain with the algometer. The tuning fork affects all these modes, and they are all necessary in stereognosis.

4. *Cerebellar Sense*: (a) By the chair-mounting test; (b) by the diadocokinesis; (c) by the revolving platform; (d) by the static equilibrium test.

Another law influencing sensory modifications is that of homolaterality. Lebar and Jacquet⁷ have shown that a hemihyperesthesia may occur during acute inflammation of any part of the body, and that it may be transferred to the opposite side by the intervention of a more severe inflammation at the reverse side of the body; for example, a fulminating focus of pleuropulmonary tuberculosis may be accompanied by an intense hemihyperesthesia; the breaking out of a focus in the opposite lung, or even the eruption of a wisdom tooth, may transfer the hyperesthesia to the opposite side. The characteristic implication of the platysma myoides muscle enables one to exclude the role of suggestion in these cases.

These considerations make, perhaps, only more needful the precautions against the influence of suggestion upon both patient and examiner while examining the sensibility, while they in no way invalidate the physiological law of summation, and the psychological law of reeducation, on account of which it is the first examination of the patient which is of paramount importance; and though they render the success of simulation more difficult, yet it becomes a more delicate task to unmask a trickster who is well instructed and clever (Bernheim⁸).

Experience teaches the neurologist to view with the greatest scepticism all evidence depending upon the statements of the patient, knowing empirically how they are fallacious even when without intent to deceive; and knowing psychologically that this must be so, on account of the very defective power of observation and introspection of the untrained laity. Some of the traps devised are: (1) *La piège du peaucier* of Jacquet; (2) Mankoff's pulse sign; (2a) pupil dilation sign; (3) simultaneous pressure trap; (4) faradic current trap; (5) counting touches; (6) diversion of attention.

CLINICAL TYPES: *Cerebral Anesthesia*. (Déjérine,⁹ Roussy¹⁰). Organic hemianesthesia may resemble that of functional type when the lesion is situated in the cortex, corona radiata, thalamus, or lemniscus; that is to say, the defect will involve all modalities of sensation in the same area; but the organic form differs in its incompleteness, being most marked at the extremities and in the fact that it passes or falls short of the middle line, although the loss of sensibility there is only partial. When the lesion is near the optic thalamus, hemianopsia may occur. It is always accompanied by

⁷ Thèse de Paris, 1906.

⁸ *L'Hypnotism et la suggestion*, 1891.

⁹ *Sémiologie du système nerveux* (*in Traité de Médecine de Bouchard Brissaud*), 1900.

¹⁰ *Le syndrome thalamique*, Thèse de Paris, 1907.

hemiataxia and astereognosis of the cerebral type, and usually by very painful subjective sensations, particularly in the shoulder-joint. The preponderance is upon the sense of attitudes, the condition is nearly always preceded by fugitive hemiplegia, and is often followed by a posthemiplegic choreoathetosis.

When cranial nerve symptoms are added to the foregoing, it can safely be said that the lesion is in the mid-brain or pons; in the latter it causes trembling, cerebellar asynergia, dysarthria, and palsy of associated lateral movements of the eyes with nystagmus on looking up or down. A hemianesthesia of subcortical origin requires a lesion so vast as to involve the motor projection fibers, and is therefore accompanied by a marked hemiplegia. But when cortical, an anesthesia is never completely segmental and is more conspicuous distally, especially with regard to localization and stereogenesis, as Bonhoffer¹¹ insists. He believes paresthesia originates in projection fibers.

Kütner¹² has demonstrated that mono-anesthesia is always cortical unless residual. Déjérine, however, believes it impossible to differentiate between cortical, subcortical, and capsular anesthesia unless in the ease of the thalamic syndrome already cited. Kütner believes the pressure and vibration senses are the least affected. Friedrich Müller¹³ agrees that it is the sense of attitudes and stereognosis which manifest the greatest disability, and that the further from the cortex, the more stable is the disturbance and the more are attacked the senses of pain, touch, and temperature.

An interesting case is that of Liepmann,¹⁴ in which there was no loss of cutaneous sensibility, but much diminution of the deep sense in a case operated upon for infantile hemiplegia.

The hysterical anesthesias are characterized by being completely removable by suggestion, and susceptible of returning under the same influence at the will of the operator (Babinski¹⁵ Williams¹⁶).

The history of their onset is generally traceable to imitation or perhaps even more often to unguarded medical examination, as in the case in which the doctor gleefully related, "The boy had no anesthesia at first, but I examined him most carefully the second time, and found the foot anesthetic; on the third occasion the leg became so, and the defect then extended up the whole limb." The stigmata are valuable corroboratively, but only as proof of suggestibility, beyond which they have no validity. The pupillary reaction to pain occurs in organic cases as well as functional cases, unless that particular afferent path is interrupted.

The fact that the anesthesia is most marked in the most paralyzed limb affords no real help to diagnosis; for this is apt to be the case

¹¹ Deut. Ztsch. f. Nervenhe., 1904, xxvi, 5 to 7.

¹² Monats. f. Psy. und Neur., 1905, xvii, 312.

¹³ Sammlung klin. Vort., 1905, Nos. 394 and 395, series xiv.

¹⁴ Neurol. Zentralbl., 1904, p. 740.

¹⁵ Conference devant l'Internat., 1906, "Ma Conception de l'Hystérie."

¹⁶ International Clinics, September, 1908.

by suggestion as well as by morphological contiguity. Nor is variability so safe a criterion as generally postulated; for Egger's¹⁷ researches have shown how variable modifications of sensibility often are even when due to organic changes. The fugitive character of pain when present is, however, in favor of hysteria, speaking generally, as is the invariability of the kind of esthetic perturbation; this is contrary to teaching in text-books, which are also erroneous in stating that distribution of disturbed sensation in spots is probably hysterical (Déjérine),¹⁸ for, as a matter of fact, such anomaly is very common in tabes and other radicular affections, and occurs also in multiple and mixed sclerosis of the cord. Involvement of all the special senses is hardly possible from purely organic causes, although the commonness of organic "point d'appui" for any hysterical clinical picture should prevent us from denying any organic element, even when hysterical factors bulk largely in the case.

As regards unilateral deafness, an organic lesion may be excluded by Gellé's test of consensual synergic response upon polypolarization of the affected side.

Cord Lesions. The Brown-Séquard syndrome is characterized by complete dissociation of sense of attitudes from deep pain, as Head¹⁹ has proved, as well as the well-known crossed loss of temperature and pain sense. The disputes regarding the loss of tactile sensibility were due, as Head has shown, to the faulty methods then employed; for a touch by the finger of the observer stimulates not only tactile but deep sensibility.

In some of these cases there is further dissociation between tactile discrimination (ascertained by Weber's circle) and tactile localization. The loss of the former is always accompanied, when due to a cord lesion, by loss of sense of passive position. Moreover, tactile localization is never impaired unless the sensitivity to touch is also diminished.

The syndrome of syringomyelia is another dissociated one, again made possible by the intramedullary regrouping of sensory impulses, for the interruption is almost confined to the heterolateral temperature and pain paths, all of which run to Gowers' tract. All forms of pain are equally involved, deep, epieritic, and protopathic, and neither protopathic nor epieritic appreciation of temperature is possible. In the exceptional cases of gliosis confined to the posterior horn no syringomyelic dissociation is present, for in this situation the sensory impulses are not yet regrouped, and hence are all involved.

The lesion of multiple sclerosis does not, as a rule, entirely interrupt the conductivity of axones, but it interferes with the equable

¹⁷ Rev. neurol., 1904.

¹⁸ Pathogenesis of Tabes Dorsalis, AMER. JOUR. MED. SCI., August, 1908.

¹⁹ Brain, 1906.

The pupils are equal and react promptly to light and accommodation. The tongue is clean and moist, and the teeth are in good condition. The examination of the heart and lungs reveals no abnormalities. The upper border of liver dulness commences at the upper border of the fourth rib in the right midclavicular line. The sharp edge of the liver can be distinctly palpated about one-half inch below the costal margin. Commencing immediately below the edge of the liver is a protuberant mass extending from the right midaxillary line to one and one-half inches below and one and one-half inches to the left of the umbilicus. It is flat to percussion, is

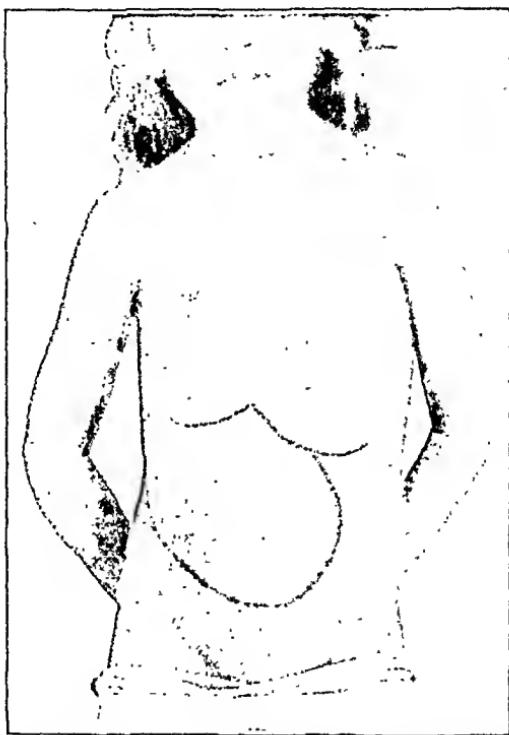


FIG. 1.—Showing the margin of the ribs and the boundaries of the tumor.

not tender, and moves downward with inspiration. It gives the impression of being cystic. There is tympany to the right, below, and to the left of the mass. Inflation of the colon shows that organ to be situated below the mass. The palpating finger is easily inserted between the tumor and the edge of the liver. Pressure has exerted such influence on the lower right portion of the thorax as to produce marked shortening and elevation of the margin of the ribs on that side. This can be seen in the accompanying photograph (Fig. 1), in which the margin of the ribs and the boundaries of the tumor have been outlined. The spleen is not palpable and no alteration in the size or position of the kidneys can be determined.

Urinalysis. Deep amber; light flocculent precipitate; acid; specific gravity, 1030; albumin and sugar negative; bile pigments positive.

Blood. Hemoglobin, 79 per cent.; erythrocytes, 4,190,000; leukocytes, 11,870. Differential count: Polymorphonuclear neutrophiles, 60 per cent.; lymphocytes, 23 per cent.; large mononuclear leukocytes, 15 per cent., transitional cells, 2 per cent.

Feces. Clay-colored; solid; faintly acid; normal odor; small number of leukocytes and epithelial cells; moderate amount of casein; occult blood negative; faint trace of urobilin.

Two days after admission to the hospital the patient was operated on by Dr. Frazier. When the mass was exposed it was found to be a cyst about the size of an ostrich egg. Coursing over its ventral surface was the stretched and flattened duodenum. The cecum and appendix were adherent to the lower pole of the cyst. The first impression was that the tumor was a cyst of the gall-bladder, but on further exploration the slightly distended gall-bladder was found lying between the cyst and the lower surface of the liver. A cannula was introduced into the cyst and about a quart of fluid resembling bile drawn off. It was then thought that the condition might be a cyst of the common duct—a view that was soon confirmed by further exploration. The adhesions were freed, the pedicle tied, and the sac removed. A dressed tube was fastened in the gall-bladder and a Mikulicz drain inserted into the wound alongside of it. In spite of vigorous stimulation, the patient failed to rally after the operation, and died three days later.

Autopsy. The autopsy, limited to the parts involved in the operation, confirmed the fact that the tumor was a cyst of the common duct. It measured 15 x 8 x 7 cm. (Fig. 2). The wall averaged about 2 mm. in thickness. The internal surface presented a peculiarly mottled appearance, by reason of the distribution of smaller and larger, irregularly shaped, brownish-green areas on a yellowish-white background. Microscopically the wall was seen to be composed of dense fibrous tissue, with an external peritoneal covering. The dark areas on the inner surface showed themselves to be more richly vascularized than the surrounding areas, and to contain deposits of bile pigments. The gall-bladder was slightly dilated; it was prevented from participating in the dilatation of the common duct by the partial obliteration of the cystic duct, resulting from compression by the cyst. The hepatic ducts were also slightly dilated. The portion of the common duct between the cyst and the duodenal papilla presented itself as a firm cord-like structure, the size of a goose quill in diameter. The extramural portion measured 1 cm. in length, and was patent; the intramural portion, which measured 2 cm. in length, was entirely devoid of a lumen. Microscopic examination of the latter portion revealed extensive fibrosis, with complete obliteration of the lumen and disappearance of all

traces of epithelial elements. No opening could be found from the duodenal papilla into either the common bile duct or the duct of Wirsung, and as far as could be determined the latter suffered the same obliteration as the duodenal portion of the common duct. This view was substantiated by the histological examination of the pancreas, which showed advanced chronic perilobular pancreatitis. The liver was large, hard, and of a dark-green color. The surface was coarsely granular. Microscopically, changes characteristic of a biliary cirrhosis were seen: marked perilobular fibrosis, moderate intralobular fibrosis, dilatation of some of the intrahepatic bile ducts, and great proliferation of bile canaliculi.



FIG. 2.—Photograph of the cyst (two-thirds natural size). *A-B*, the opening of the cystic and hepatic ducts into the cyst; *B-C*, the left wall of the common duct, forming the left wall of the cyst; *C*, the peripheral end of the common duct.

I have collected twenty-eight cases of retention cysts of the common bile duct from the literature. Some of the reports are so meagre as to make them of interest only in so far as to put the case concerned on record. Others are more elaborate, and, with the case herein reported, permit the compilation of some interesting data bearing upon the condition.

Of the 19 instances in which the sex is mentioned, 17 occurred in females. Such a preponderance of one sex is indeed striking; and yet an analysis of the cases throws no light upon the significance of this relative frequency of the condition in females. The features which tend toward the greater frequency of other diseases of the

biliary passages, especially gallstones, in females are certainly not concerned in the production of cysts of the bile ducts, for these features are, for the most part, dependent upon modes of dress or functions peculiar to the female sex, possible only in adult life; and the majority of cases of cysts have occurred in the young. Of the 22 cases in which the age was mentioned, the average was fifteen years and eight months; 2 were under one year of age; 7 were between one and ten years of age; 6 between ten and twenty years of age; 4 between twenty and thirty; 1 between thirty and forty; and 2 between forty and fifty years.

Turning our attention to the anatomical peculiarities presented by the cases that have been studied, especially in regard to the lower end of the common duct and any condition there existing to cause obstruction, we find that of the 19 cases in which the result of this examination was mentioned, gallstones were found in 3, a papilloma in 1, myomyxomatous polyps in 1, scirrhouus pancreatitis in 2, catarrhal cholangitis in 1, a simple stenosis or obliteration of the peripheral end of the lumen in 6, and a valve-like fold or angular insertion of the duodenal end of the duct in 5 cases. In addition, 2 of the cases in which the peripheral end of the duct was obliterated showed also this angular insertion. This great variety in the apparent cause of the obstruction and subsequent dilatation at once suggests that there is no unity of the pathogenesis of cysts of the bile ducts, but that any obstruction of the lower end of the duct may lead to cyst formation. However, let us conduct a further analysis. Of the 4 cases over twenty-one years of age in which the cause of the obstruction was mentioned, gallstones were found in 2, a papilloma in 1, and a valve-like fold in 1. Whereas, in the 13 cases under twenty-one years of age, a simple obliteration of the lumen was found in 6 instances, a valve-like fold in 4, catarrhal cholangitis in 1, and scirrhouus pancreatitis in 2. I doubt the value of the opinion that scirrhouus pancreatitis was the cause of the obstruction in the 2 cases so reported. They were both observed many years ago—one in 1723, the other in 1817. Considering the degree of firmness presented by the normal pancreas to palpation, and realizing the infrequency of scirrhouus pancreatitis in childhood, I am loath to accept this diagnosis unsupported by a histological examination.

In considering the cases in which an obliteration of the lower end of the duct was found, we can but conjecture what the cause of this obliteration may have been. The fact that practically all these cases occurred in early life might suggest that a congenital atresia of the bile ducts was at the basis of the condition, but this is extremely improbable, for the vast majority of infants suffering with congenital atresia of the bile ducts die before the eighth month of life.¹ The fact that the case reported by Rolleston showed many manifestations of congenital syphilis, and the probable history of

¹ Lavenson, Jour. Med. Research, 1908, civ, 61

syphilis in the father of the patient whose case I am reporting, naturally direct attention to the possibility of the obliteration being the result of a syphilitic fibrosis. However, in the other cases there is not sufficient basis for entertaining this opinion; and it must be considered as but a vague possibility. Another possibility is that the obliteration was the result of the organization consequent upon a catarrhal cholangitis. This hypothesis seems plausible in my own case, at least, by reason of the fact that symptoms of catarrhal cholangitis preceded for some time the development of the tumor; though, of course, it must be admitted that the latter may have been present a considerable period before it was recognized by the parents. Why the duct should undergo such extensive dilatation in the presence of an obstruction in early life, as compared with the infrequency of the same occurrence in the obstructions of later life, is difficult to explain. Probably the force with which the bile is excreted is not much less in early life than in adult life, but the more delicate walls of the bile ducts of the young are less able to withstand the strain of increased internal pressure. There must, however, be some element in addition to this; otherwise it would be rational to expect to find cysts in at least some of the cases of congenital obliteration of the bile ducts in which the obstruction is in the lower end of the duct; I am not aware of any such case having been reported. The other element in the production of the cysts is, in all probability, a congenital weakness of the muscular tissue of the wall of the duct.

In the cases of Douglas, Arnolds, Fenger, Arnison, Rostowzew, and Konitzky, and in my case, the lower end of the duct, or its fibrous remains, was found to enter the cyst at so acute an angle as to produce a valve-like formation at the duodenal end of the cyst. Rostowzew looks upon this angular insertion of the duct as the cause of the obstruction and the subsequent dilatation. His view can be best appreciated by glancing at the accompanying diagrams. As is shown in Fig. 3, the intramural portion of the common duct runs normally from left to right; in other words, in the same direction as the portion of the duct above the duodenum, but at a somewhat more acute angle. Rostowzew believes that in some cases the intramural portion of the duct, instead of running from left to right, runs from right to left, as is shown in Fig. 4. This according to his view produces a kink, which results in obstruction to the outflow of bile and subsequent cyst formation, as is shown in Fig. 5. I believe Rostowzew's hypothesis to be incorrect. In my opinion the angular insertion of the duct is the result of the cyst formation, and not its cause. If one recalls the anatomical relations of the common bile duct as it runs in the gastrohepatic omentum, it will be appreciated that lying farthermost to the right as it does, any tendency to dilatation that it may assume toward the left would have to overcome the resistance offered by the hepatic artery and the portal vein; whereas, to the right no structures are interposed to restrict its dilatation.

In my case, in which, in addition to obliteration of the duodenal end of the duct, this angular insertion was found, it can be seen by glancing at the accompanying photograph of the cyst (Fig. 2) that the dilatation was entirely to the right. The short straight line *B-C* represents the left wall of the common duct, the right wall alone being distended to form the cyst. With such extensive dilatation to the right, the peripheral undilated portion of the duct is compelled to change its direction, and instead of running from left to right, as it normally does, to run sharply from right to left, as is shown in Fig. 6.

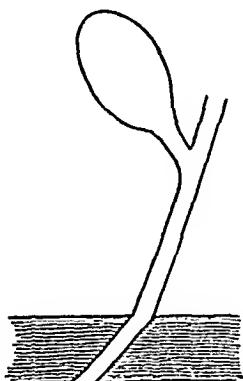


FIG. 3

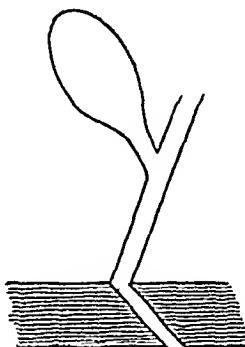


FIG. 4

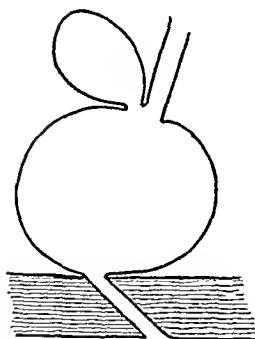


FIG. 5

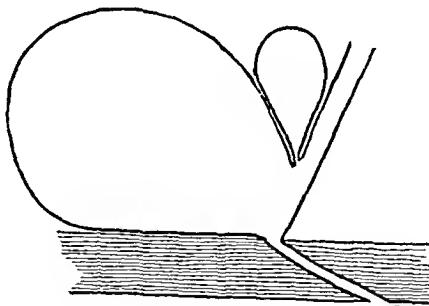


FIG. 6

FIGS. 3, 4, 5, and 6.—The varying modes of insertion of the common bile duct into the duodenum.

This view is substantiated by the fact that in 3 of the 7 cases in which this angular insertion was present, obliteration or obstruction of the peripheral portion of the lumen was also found. In the other 4 cases it is not specifically mentioned whether or not the peripheral portion of the duct was patulous. Assuming that it was patulous, I believe it probable that in the presence of a congenital weakness of the muscular tissues of the duct wall a temporary obstruction, as by a catarrhal cholangitis or a mucous plug, could offer sufficient resistance to the outflow of bile to result in dilatation and a consequent

angular insertion of the lower end of the duct. Even though the cause of the obstruction should subsequently subside, by the time the cyst is formed the valve-like opening could undoubtedly act as a secondary cause of obstruction.

SYMPTOMATOLOGY. There is little to be said of the symptomatology of the condition, aside from what has already been mentioned in discussing its pathology and pathogenesis. It should be recalled that in many of the cases symptoms of biliary obstruction have preceded the formation of a cyst, or, probably better, the recognition of a cyst, by a considerable period of time. Recognition must also be taken of the fact that it occurs relatively much more frequently in childhood and in the female sex. The conditions with which it is most likely to be confused are cysts of the pancreas and dilatation of the gall-bladder. Probably, in the vast majority of cases, only an exploratory incision will determine the diagnosis.

TREATMENT. It can be readily appreciated that surgery offers the only possibility of cure. Of the 21 cases in which more or less extensive surgical procedures were adopted, simple puncture of the cyst was performed in 3 cases, all of which resulted in death. Incision and drainage was performed in 14 cases, with 13 deaths. Choleecystenterostomy was performed in 4 cases, with 3 recoveries. The latter operation thus seems to offer the best chances of cure.

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SOME CASES OF MULTIPLE INFECTION.

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ALTHOUGH the subject of multiple infection has always commanded attention, it has recently gained added interest, owing to the use of bacterial vaccines in the treatment of many infectious diseases. The following cases show that these methods must at times be directed toward the destruction of several varieties of bacteria in order to accomplish any results, and they are, for the most part, examples of the entrance of bacteria through perforations of the gastro-intestinal tract.

There is quite an extensive bacterial flora present in the intestinal tract. Ford¹ has made a very exhaustive study of this subject, and has isolated a large number of pathogenic bacteria from the intestine. In addition to various saprophytic organisms, Ford and others have found that the intestine contains such bacteria as *Bacillus coli*, *Bacillus aerogenes*, *Bacillus Friedländeri*, *Bacillus enteritidis*, *Bacillus paratyphi*, *Bacillus dysenteriae* (these types do not agglutinate with dysenteric serum), *Bacillus pyoeyaneus*, *Staphylococcus albus*, *Staphylococcus aureus*, *Streptococcus pyogenes*, and *Bacillus aerogenes capsulatus* (Weleh).

CASE I.—The first case of multiple infection which we wish to report occurred as an extensive fibrinopurulent peritonitis following the perforation of a typhoid ulcer. The history of the case is as follows: About four and one-half months before his death the patient complained of cough, dyspnoea, a sense of oppression in the chest, and occasional attacks of suffocation. He gave a history of slight indulgence in alcohol, but no venereal history. About two and one-half months before his death he entered the hospital. The signs of an aneurysm of the arch of the aorta were detected, and the patient remained up and about the wards of the hospital until four days before his death. On February 4 his temperature rose to 104° and he was ordered to bed. The next day his temperature was normal and he was allowed to sit up and walk about the ward. On February 7 and 8 he remained in bed, and a slight distention of the abdomen was noticed. He died on the night of February 8.

The aorta showed a general dilatation beginning just above the valves and ending at the origin of the great vessels. The dilatation

¹ Studies from the Royal Victoria Hospital, Montreal, i, No. 5.

was uniform, and not saccular or fusiform. The intima of the aorta showed marked endarteritis and atheroma. The aorta measured 10.5 em. in diameter. The abdominal cavity contained about 1 liter of purulent fluid, and the peritoneal surface of the intestines and liver was covered with a fibrinopurulent exudation. A small perforation of the small intestine was found about 30 em. above the cecum, and on opening the intestine a smooth-walled ulcer was detected. Numerous other ulcers indicating the third week of the typhoid fever were found. The patient had gone through almost a complete attack of typhoid fever, ending in perforation and extensive fibrinopurulent peritonitis, without any fever or any of these conditions being even suspected.

The point of main interest in this case, however, is the extensive multiple infection of the peritoneal cavity, and the number of different bacteria present shows how many different species can take part in an infection when the contents of the intestine are emptied into the peritoneal cavity.

Bacteriological Examination. Cultures were made from the pus from the peritoneal cavity and from the blood of the heart and spleen on the Drigalski-Conradi medium in Petri dishes, and numerous colonies of the typhoid bacillus and the colon bacillus developed from the cultures from the spleen and blood. No typical typhoid colonies were grown from the cultures from the peritoneal cavity, but four other distinct varieties of bacteria were obtained. These were *Streptococcus pyogenes*, *Diplococcus pneumoniae*, *Bacillus aerogenes capsulatus*, and *Bacillus coli*. *Streptococcus pyogenes* was typical in morphology and cultural characteristics, and *Diplococcus pneumoniae* showed capsules stained by Hiss' method, and was virulent for white mice. *Bacillus aerogenes capsulatus* produced the typical reaction in milk and its capsule stained by Welch's method. It was positive to Gram's stain and produced the foamy organs from hydrogen gas when injected into rabbits, who were immediately killed and exposed to 80° F. for fifteen hours. Control rabbits were negative. *Bacillus coli* was typical and produced gas in glucose, lactose, and saccharose.

The presence and location of these various bacteria were studied in stained specimens of the typhoid ulcers and the fibrinopurulent exudate on the peritoneal surface of the intestine. The necrotic material at the base of the ulcer contained numerous large Gram-staining bacilli which were almost certainly gas bacilli. These were mingled with other smaller bacilli with rounded ends which were colon bacilli. Numerous chains of streptococci were also found in these necrotic areas and diplococci were also present. Many of these latter closely resembled the pneumococcus, but it is impossible to distinguish absolutely between these and streptococci. Cover-slips stained at autopsy from the peritoneal exudate showed all four of these types mentioned above, but stained sections of the

intestine showed only three types of organisms in the mesh-work of the fibrinopurulent exudate on the peritoneum. The large Gram-staining gas bacilli were arranged in large round masses, but the streptococci and diplococci were scattered through the exudate. No *colon baeilli* could be noted in this exudation, and most of these latter organisms must have been free in the general peritoneal cavity. While all of these organisms must have been present in the intestinal contents, yet they first exerted their pathogenic effects upon the necrotic base of the typhoid ulcers. The rupture of one of these ulcers must have introduced many of these organisms in a virulent condition directly into the peritoneal cavity, where they produced a very extensive fibrinopurulent peritonitis.

This case, therefore, showed the presence of five organisms in the body, four in the pus from the peritoneal cavity and one (*Bacillus typhi*) in the blood.

Another patient with typhoid fever entered the city hospital several years ago and died after a prolonged and severe illness. Numerous ragged, necrotic ulcers were found at the autopsy, and small scattered abscesses were found in the kidneys. Cultures from the blood, liver, and spleen showed the presence of many colonies of *Bacillus typhi*, *Bacillus coli*, *Bacillus pyoeyaneus*, and *Streptococcus pyogenes*, and cultures from the abscesses of the kidney gave *Staphylococcus aureus*.

Finney² records the results of a bacteriological examination of the peritoneal exudate in five cases of intestinal perforation of a typhoid ulcer. In one a pure culture of *Bacillus coli* was found, in one *Streptococcus pyogenes*, in one *Staphylococcus aureus* and *Bacillus coli*, and in one *Bacillus coli* and an unknown micrococcus were obtained. In one case the cultures were sterile. Cushing³ also reports a case of a typhoid perforation at the end of the fourth week. There was diffuse purulent peritonitis, and cultures made at the autopsy from the pus gave *Streptococcus pyogenes* in pure culture.

Flexner⁴ also describes several cases of polyinfection in typhoid fever. The first case was that of a woman, aged thirty years, who aborted several days before death. The typhoid bacillus was found in the placenta, spleen, liver, and kidneys, the colon bacillus in the kidney and heart's blood, and *Bacillus proteus* in the bile. In the second case death occurred in the sixth week. Healing ulcers were found, together with an abscess of the prostate gland, bronchopneumonia, and serofibrinous pleurisy. The typhoid bacillus was isolated from the blood, liver, bile, kidneys, and mesenteric glands, while *Streptococcus pyogenes* was found in the lungs, pleural cavity, heart, and larynx. The larynx also contained *Bacillus pyoeyaneus*, and

² Johns Hopkins Hospital Reports, 1900, viii, 160.

³ Ibid., p. 224.

⁴ Ibid., p. 259.

the abscess in the prostate gland gave *Proteus vulgaris*. In a boy, aged nineteen years, with perforative peritonitis, the typhoid bacillus and *Streptococcus pyogenes* were cultivated from the pus.

Flexner,⁵ in an earlier article, also reported several interesting cases of multiple infection in typhoid fever. In the first case there was a general typhoid bacteremia, and the autopsy showed multiple abscesses in the kidney and purulent infiltration of the parotid gland. Cultures from the heart's blood and the kidney showed nothing but typhoid bacilli, while the parotid gland gave pure streptocoeci, and the lung streptocoeci, typhoid bacilli, and *Bacillus coli*. In a second case, a general infection with typhoid and perforative peritonitis, *Bacillus typhosus* was isolated from the heart, bile, and other viscera, while the streptocoecus alone was found in the purulent exudate in the peritoneal cavity. In one other similar case the peritoneal cavity contained the typhoid bacillus, the colon bacillus, *Proteus vulgaris*, *Streptococcus pyogenes*, and *Staphylococcus aureus*; while another case of perforative peritonitis showed the streptocoecus and colon bacillus.

CASE II.—We have also observed an interesting case of multiple infection in a steer, which was first noticed in one of the large abattoirs after the heart and lungs had been removed from the carcass. Fig. 1 shows the heart muscle containing a needle. The description of the gross specimen is as follows: Practically the entire visceral surface of the pericardium covering both auricles and ventricles is covered with a thick, dirty, grayish-yellow, fibrinous membrane which is either shaggy or coarsely corrugated. This is firmly adherent, and when stripped off leaves a rather pale, light brown, opaque, cardiac muscle beneath. The parietal pericardium is either red and injected or is covered with a thick fibrinous membrane. Midway between the apex of the left ventricle and the auriculoventricular septum there is a round, dark red, hemorrhagic area about the size of a fifty cent piece. This contains an irregular perforation, in the centre of which a rusty needle, embedded by its point, can be seen. The needle has not completely penetrated the wall of the left ventricle. The needle was firmly embedded in the muscular surface of the left ventricle, but could work to and fro quite loosely in the tear of the stomach wall. This irregular tear in the stomach might, therefore, be explained by the movement of the heart upon its axis. The needle firmly embedded in the heart must have moved to and fro at its periphery with a motion somewhat similar to that of a pendulum. In this way it gradually produced the irregular tear in the stomach, although it was swallowed and penetrated the stomach wall first, and later the heart muscle.

Sections were made from the wall of the left ventricle, which was covered by the thick, fibrinous membrane, and the following condi-

tions were noted: The heart muscle itself is normal, but the pericardial surface is covered with a rather thick layer of organizing fibrous tissue. This fibrous tissue contains a few newly formed bloodvessels and is richly infiltrated with fibroblasts of various shapes and sizes. A moderate number of polymorphonuclear leukocytes are also present. Attached to the outer surface of this is a thick layer of very coarse fibrin, which also shows signs of beginning fibrous organization; newly formed bloodvessels and fibroblasts can be seen entering it at its attachment to the fibrous pericardium, and layers of endothelial cells covering the pericardium can be seen proliferating and heaping themselves up into layers of several cells in thickness. There are groups of fibroblasts scattered through this organizing fibrin.

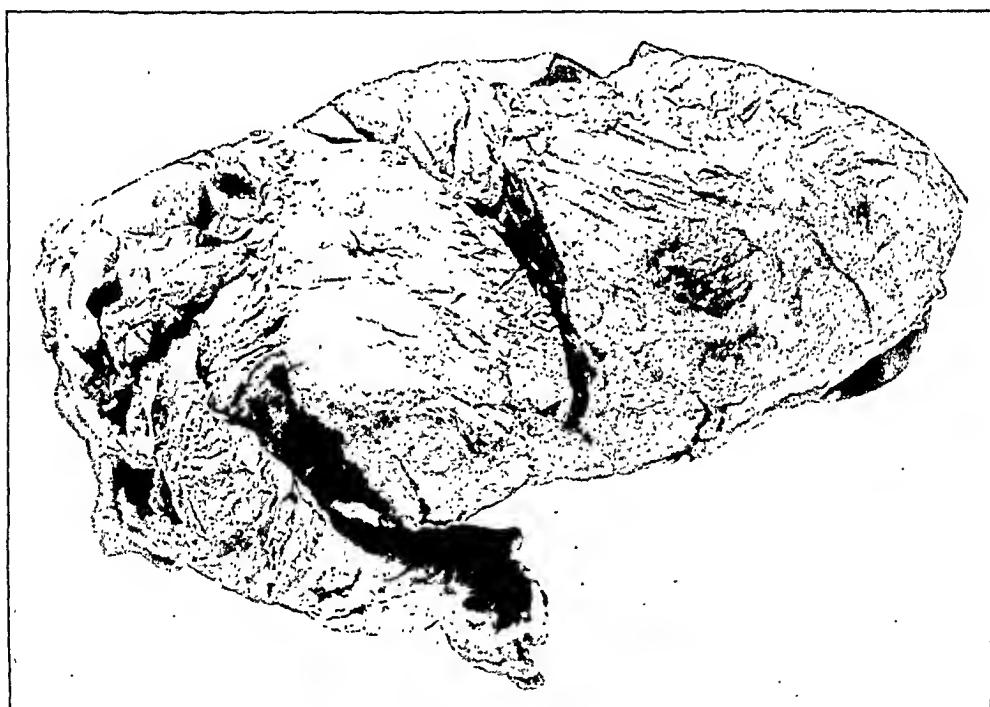


FIG. 1.—Showing a needle in the muscular wall of the heart, surrounded by a hemorrhagic area, and showing also thick masses of fibrin.

Sections were also made of the oedematous mediastinal tissue adjacent to the pericardium. This consists of much oedematous fibrous tissue, which is diffusely infiltrated with polymorphonuclear leukocytes. These are often in large groups, forming small miliary abscesses.

Sections from the stomach showed, just adjacent to the perforation by the needle, that the mucous membrane and submucous coat are entirely replaced by a thick surface layer of fibrin and deeper layer of coagulation necrosis. The superficial layer con-

tains large, irregular groups of bacteria; there are also scattered groups of polymorphonuclear leukocytes, and many fibroblasts can be seen entering the inflammatory layer at its junction to the muscular wall of the stomach. Some of these cells are large and round, their cytoplasm stains with eosin, and they resemble lymphocytes. A lymph gland adjacent to the stomach shows great enlargement of the lymph sinuses, and these sinuses contain many polymorphonuclear leukocytes and large and small lymphocytes. The germinal centres in many of the lymph follicles are well shown, but no bacteria are present.

The abscesses in the liver show central areas of complete necrosis. These areas are surrounded by polymorphonuclear leukocytes and the abscess is enclosed by a thick connective-tissue capsule containing numerous fibroblasts and polymorphonuclear leukocytes. The capsule of the abscess also contains small scattered abscesses.

Cultures were made from the fibrinous exudate on the pericardium and from the abscess of the liver. Three distinct species of bacteria were obtained in each instance. These were *Bacillus coli*, *Bacillus aërogenes capsulatus*, and the *pneumococcus*. *Bacillus coli* fermented about 40 per cent. in glucose, lactose, and saccharose, and its cultural characteristics were typical. *Bacillus aërogenes capsulatus* stained by Gram's method shows well-stained capsules and produced the typical "Schaumorgane," or foamy organs, when injected into the ear vein of a rabbit. The *pneumococcus* showed a capsule, coagulated and acidulated milk, and produced the death of a rabbit in forty-eight hours. At the autopsy on the rabbit the lungs were covered by a fibrinous exudate and the right lung was consolidated and sank in water. On microscopic examination the lung contained large groups of cells which seemed to be necrotic epithelial cells; other areas contained an exudate of polymorphonuclear leukocytes or showed intense congestion. On staining by Weigert's method the air vesicles contained pneumococci, and these organisms were also obtained from the lung by cultures. The liver showed fatty degeneration and the capillaries contained hyaline thrombi apparently due to agglutinating red corpuscles. The *pneumococcus* was recovered by cultures from the blood of the heart and liver.

CASE III.—A case of puerperal infection with *Bacillus aërogenes capsulatus* and *Streptococcus pyogenes*, which entered the obstetrical ward of the hospital, was also of some interest from several standpoints.

The patient had a normal child in 1901, and in 1902 was treated for retroversion of the uterus. In 1905 the patient went into labor, and as the position of the child was transverse it remained undelivered for four days, although podalic version was attempted. At the end of four days the patient was admitted to the City Hospital with a temperature of 102°, and rapid and faint pulse and respira-

tions. She grew rapidly weaker and died several hours after admission.

An autopsy was performed and the fundus of the uterus was only 7 cm. below the tip of the ensiform cartilage. The peritoneal surface was covered with a fibrinopurulent exudate and the broad ligament and the pelvic fascia were distended by a dark-red fluid containing many gas-bubbles. The anterior and lateral walls of the vagina and bladder were ruptured. The body of the child had escaped into the vagina, but the head was still in the uterus, the retention of the head being caused by its greatly increased size. The frontal and parietal bones were separated by an interval of 3 em., and there was an interval of 11 cm. between the parietal and occipital bones. The parietal bones were separated from each other by an interval of 10 cm. On opening the abdomen of the child gas escaped which burned with a blue flame, and the liver contained many gas blebs. Fig. 2 is a reproduction of a photograph of the foetus.

On bacteriological examination *Streptococcus pyogenes* was found in the liver of the mother and in the fibrinopurulent exudate. *Staphylococcus aureus* and *Bacillus coli* were also found in a hemorrhagic area on the transverse colon. *Bacillus aerogenes capsulatus* or the gas *bacillus* was not found in the peritoneal cavity, the liver, or the kidney of the mother. The uterine cavity remained sterile, but *Bacillus aerogenes capsulatus* was found in the placenta, in the uterine wall, and in the distended pelvic fascia and the broad ligament. The brain, liver, kidney, and blood of the child all contained gas *bacilli*, and on staining these tissues they were found to be present in large numbers. The placenta at its uterine attachment showed a thick layer of decomposing material containing gas *bacilli*, and they were also found in the maternal blood spaces and neerotie villi. They had not invaded the tissues of the uterus to any extent, and as the autopsy was performed within two hours after death it is interesting to note that *Bacillus aerogenes capsulatus* invaded only dead or decomposing tissue. The body of the dead child and the decomposing placenta contained many gas *bacilli*, but these did not penetrate the uterus of the living mother and invade the peritoneal cavity, as did *Bacillus coli*, *Streptococcus pyogenes*, and *Staphylococcus aureus*.

The case is also interesting from another standpoint, namely, the mechanical obstruction to the delivery of the child, caused by the tremendous distention of the head. The gas infection was limited to the child, while pyogenic bacteria produced an infection of the mother.

Bacillus aerogenes capsulatus, or the gas *bacillus*, was first observed in puerperal infection by Dobbin,⁶ in 1897. This occurred

in a case of physometra, or a gaseous distention of the uterus. Little⁷ states that *Bacillus aërogenes capsulatus* may produce five distinct effects when introduced into the uterus. These are emphysema of the foetus, puerperal endometritis, physometra, emphysema of the uterine wall, and gas sepsis. Cases illustrating all of these conditions are mentioned in Little's article, but we shall only briefly



FIG. 2.—Fœtus with the enlarged and disfigured head caused by gaseous distention. The arms were torn off in an effort to perform version.

describe his cases of emphysema of the foetus. His first case was that of a Bohemian woman, with contracted pelvis and dystocia. After frequent examinations by a midwife during a labor of four days the patient was admitted to the Johns Hopkins Hospital. The head was found firmly fixed in the superior strait and the uterus

⁷ Bull. Johns Hopkins Hospital, 1905, No. 169, xvi, 136.

was in a state of tetanic contraction, and delivery was only effected after using Tarnier's basiotribe. The gas bacillus was demonstrated in the distended head and tissues of the foetus, and in the placenta. The second case also occurred in a case with contracted pelvis. Several unsuccessful attempts with forceps were made to deliver the child, and after admission to the hospital the head was found to be blocked in the cervix, and the uterus was in a state of tetanic contraction. The head was perforated and the child could then be delivered. Cultures showed the presence of *Bacillus aerogenes capsulatus*. Both of these cases are similar to our own case in having caused obstruction to delivery by gaseous distention of the head of the foetus.

CASE IV.—Another multiple infection of a different kind occurred in connection with a case of mumps. The child was admitted to the City Hospital with swelling of the right parotid gland, and a diagnosis of mumps was made. The fever suddenly became very high, and after several days the patient died. At the autopsy the gland and the surrounding tissues were very much swollen, and the latter contained a seropurulent fluid. The spleen was enlarged.

Cultures from the parotid gland, the blood, liver, kidney, and spleen gave a pure growth of *Streptococcus pyogenes*. The microscopic examination of the various tissues and viscera showed that *Streptococcus pyogenes* was present in large numbers, and that these organisms had produced a number of lesions.

The interalveolar septa of the lungs were greatly thickened, and contained many necrotic areas and groups of polymorphonuclear leukocytes containing many streptococci. Many small bronchi and their surrounding air cells contained masses of streptococci and the capillaries contained emboli of organisms. Some of the pulmonary veins showed fibrinopurulent thrombi with many streptococci. The lymphatic vessels and spaces of the heart and spleen were filled with streptococci and the veins contained infected thrombi. The splenic spaces were filled with groups of necrotic reticular cells and streptococci. An area of necrosis in the pharynx, adjacent to the parotid gland showed a superficial necrotic area containing masses of streptococci which extended into the muscle beneath. The veins contained fibrinous thrombi and streptococci and the lymphatic vessels and perineurial and perivascular connective tissue were crowded with these organisms. The entire tissue was densely infiltrated with polymorphonuclear leukocytes and fragmented nuclei. The lymphatic glands in this region contained many areas of necrosis with leukocytes and streptococci, and the connective tissue surrounding the parotid gland was infiltrated with polymorphonuclear leukocytes and lymphocytes, necrotic masses, areas of fibrin, and groups of streptococci. The parotid gland itself did not show any necrosis or cellular infiltration, but the arteries and veins contained fibrinopurulent thrombi and streptococci.

The cytoplasm of many of the cells of the acini contained numerous hematoxylin-staining granules varying in size from 1 to 3 mm. These granules (Fig. 3) were not derived from the nuclei of the secreting cells. They resemble small protozoa, but we are not prepared to say that they bear any causative relation to mumps.

The lymphatics of the kidney, pancreas, pituitary body, thymus and thyroid glands, and the semilunar and Gasserian ganglion contained emboli of streptococci, and many veins showed fibrinous-purulent thrombi and organisms. The presence of streptococci in the veins in some places caused injury to the endothelium, many of

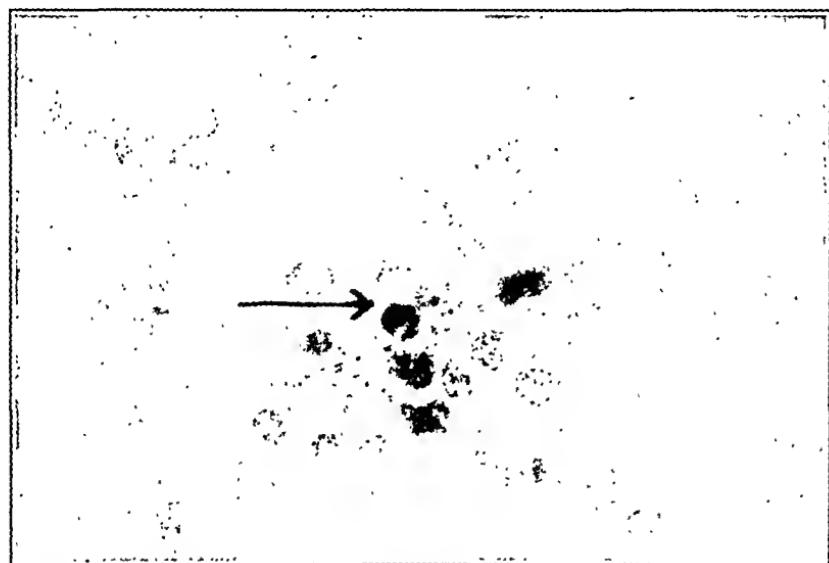


FIG. 3.—An acinus of the parotid gland, showing a number of intracellular bodies in the cytoplasm of an epithelial cell.

these cells having completely disappeared, while others showed marked nuclear fragmentation.

The entire picture is that of an intense bacteremia originating from the parotid gland, and causing purulent, necrotic, fibrinous, and endotheliolytic lesions throughout the entire body.

Another somewhat similar case occurred lately in the City Hospital. A man, aged about thirty years, was admitted with high irregular fever, and great swelling at the angle of the jaw. His body was covered with purpuric spots. He died in about three days. No autopsy was obtained, but a blood culture during life showed numerous colonies of *Streptococcus pyogenes* and *Staphylococcus aureus*.

DIAPHRAGMATIC HERNIA.

BY E. T. BELL, M.D.,

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DIAPHRAGMATIC hernia is not a very rare condition. In 1899 Grosser was able to collect 433 reported cases. Considerable attention has been given this subject ever since the work of Leichtenstern¹ appeared. It may seem almost superfluous to add another to the long list of publications on this topic; but the case which I shall describe is an unusual form.

Extensive discussions of the literature may be found in the papers of Lacher,² Thoma,³ and Grosser,⁴ to whose publications the reader is referred. I shall give some of the conclusions to which these discussions lead. Diaphragmatic hernias may be true or false. In true hernias the displaced abdominal organs are invested by a covering of pleura or peritoneum, or both. In the false hernias the serous covering is absent. Grosser's statistics give 40 true and 385 false hernias, 30 of the true hernias being congenital. Diaphragmatic hernias are also classified as congenital, or acquired, although the distinction cannot always be made with certainty. Grosser gives 244 congenital and 181 acquired cases.

Every abdominal organ except the rectum, bladder, and genitals has been found at least once in the thoracic cavity. Usually several organs occur there together. In Lacher's 276 cases the stomach was found in the hernia 161 times; the colon, 145 times; the omentum, 96 times; the small intestine, 83 times; the liver, 45 times; the duodenum, 35 times; the pancreas, 27 times; the cecum, 20 times; the kidney, twice. In 53 of his cases only one organ occurred in the hernia: the stomach alone, 27 times; the colon, 13 times; the small intestine, 6 times; the liver, 6 times; the omentum, twice. The etiology will be discussed latter.

The case observed was that of a negro male, about forty years old, a subject used in the dissecting room. The previous history was not obtainable. Death occurred apparently from a tuberculous pneumonia. The right lung was completely consolidated, and the left contained a number of tuberculous abscesses.

Fig. 1 gives a view of the right side of the thorax. The inferior lobe of the lung has not been removed, and the dotted line *m* indicates the position of the lower border of the base of the lung. It is seen that a small part of the liver *H* projects through the diaphragm. The piece of liver displaced is continuous with the

¹ Zur Diagnose der Hernia diaphragmatica. *Berliner klin. Woch.*, 1874, Nr. 40.

² Ueber Zwerchfellhernien. *Deutsch. Archiv f. klin. Med.*, 1880, xxvii.

³ Vier Fälle von Hernia diaphragmatica. *Virchow's Archiv*, 1882, lxxxviii.

⁴ Ueber Zwerchfellhernien. *Wiener klin. Woch.*, 1899, s. 655.

main mass of the organ in the abdominal cavity (Fig. 2). It is 8 cm. long and 5 cm. wide, and 2 cm. to 3 cm. high. No part of any other organ is involved in the hernia. It is a false hernia, there



FIG. 1.—Hernia projecting through the diaphragm, viewed from the right side after removal of the superior and middle lobes of the lung ($\times \frac{1}{2}$). *b*, right bronchus; *D*, diaphragm; *H*, portion of liver in the hernia; *1*, inferior lobe of the lung; *M*, broken line representing the lower border of the lung; *r*, 7th rib.

being no pleural or peritoneal sac present. The opening in the diaphragm is elliptical in shape and much smaller than the hernial mass of liver. The opening is 5 cm. long and 2.3 cm. wide, while the displaced mass of liver is 8 cm. long and 5 cm. wide.

The opening is situated in the muscular part of the diaphragm on the edge of the tendinous portion in the angle between the middle and right leaflets of the central tendon. The long axis of the opening coincides with the direction of the muscle fibers. The muscle fibers are apparently torn apart, not ruptured transversely.

The margins of the opening are smooth and fit closely around the neck of the hernia, in part of their extent being adherent to the surface of the liver. The diaphragm is so closely fitted around the neck of the hernia that there could hardly have been any interference with respiration. The edges of the neck of the hernia have been converted into cicatricial tissue *c* from the pressure of the diaphragm.

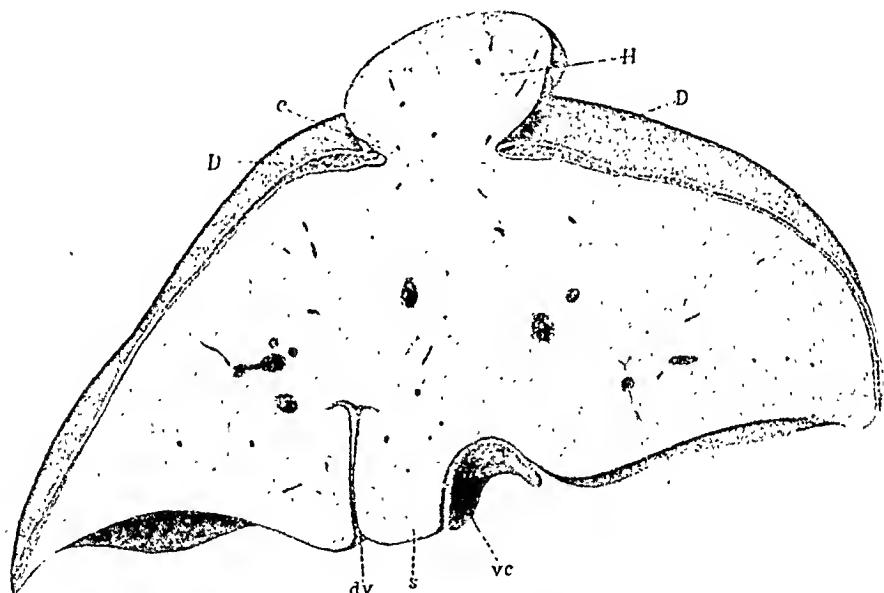


FIG. 2.—Horizontal section through the upper part of the liver passing through the hernial opening ($\times \frac{1}{2}$). *d*, *v*, fissure for the duetus venosus; *c*, cicatricial tissue on the edge of the neck of the hernia; *D*, diaphragm; *H*, mass of liver forming the hernia; *s*, Spigelian lobe; *v c*, vena cava.

ETIOLOGY. Congenital hernias are due to developmental defects in the diaphragm. The formation of the defect occurs some time before the displacement of the abdominal organs. Some of these defects are unquestionably due to incomplete union between the ventral and dorsal anlagen of the diaphragm; for others no satisfactory explanation has been advanced. The size of the opening varies from a 2 cm. opening to complete absence of the diaphragm.

The acquired hernias are traumatic in origin. They are distinguished from the congenital by the following points: (1) All hernias in the newborn in which there is no record of injury during birth are regarded as congenital; (2) most acquired hernias are diagnosed by a previous history of injury; and (3) in congenital

hernias the edges of the opening are said to be usually much smoother than in the traumatic form. Without a previous history of injury the distinction may sometimes be difficult. Many of the cases given in the literature do not certainly belong to the type to which they are referred.

The usual causes of traumatic hernia are gunshot wounds, saber cuts, severe falls, and heavy blows. The natural openings in the diaphragm are frequently the site of hernia.

Diaphragmatic hernias are about five times as frequent on the left as on the right side. This applies to the congenital as well as to the acquired forms. It is generally believed to be due to the greater protection afforded by the liver on the right side. The traumatic hernias are four or five times as numerous in males as in females, owing to the greater exposure of the males to injury.

In Lacher's statistics two cases are cited in which a small mass of liver alone projected through the right side of the diaphragm. These were then somewhat similar, at least, to the one I have just described. Both of these were interpreted as traumatic.

In my case, as stated above, the long axis of the opening corresponds to the direction of the muscle fibers. The muscle fibers are pulled apart and are not torn. They encircle the opening. This arrangement is much more likely to occur from a tear than in the formation of a defect. I therefore regard the case as an acquired hernia of long standing. The edges of the opening are smooth and even, but this may be the case in an acquired hernia of long standing as well as in congenital hernias. The diaphragm may have been congenitally weak at the place of rupture. After the formation of the tear the negative pressure in the thorax during inspiration would cause the liver to be gradually drawn into the thoracic cavity.

REVIEWS.

THE RECTUM: ITS DISEASES AND DEVELOPMENTAL DEFECTS. By SIR CHARLES B. BALL. Pp. 328; 186 illustrations. London: Henry Frowde, 1908.

THIS is not a revision of Ball's previous book, *The Rectum and Anus* (1887-1894), but is a new work based on the author's Lanc Lectures (1902) and Erasmus Wilson Lectures (1903). The 5 plates and 181 illustrations are chiefly from stereophotographs of actual cases or specimens. It is a valuable though not an exhaustive treatise on the subject. Its teachings are in the main in accord with those of most surgeons in this country, and are to be commended. The illustrations add to the value of the text.

Developmental defects are fully dealt with in three chapters. There can be little dissent from the statement that in the many varieties of imperforate rectum and anus the decision as to treatment will depend on whether the obstruction to the fecal current is complete, partial, or associated with a fairly efficient fecal outlet; nor from the general conclusions that in the first case immediate operation is essential to save life, in the second it cannot well be long delayed, while in the third the surgeon may well wait until the child is older, and select his own time for carrying out a well-planned and deliberate operation.

In the chapter on diagnosis, the views of Harrison Cripps as to the slight value of rectal specula as ordinarily used and without anesthesia—though no mention is made of them—seem to be concurred in. The author says of specula: "Personally, I have little reliance on their aid to diagnosis. It is by the sense of touch rather than by sight that disease of the interior of the rectum is best recognized. Some form of duck-bill speculum may occasionally be useful, Hegar's vaginal retractor answering all purposes when it is desirable to see the lower portions of the rectal mucosa. For disease of the bowel higher up, tubular specula, rectoscope, and colonoscope are sometimes used. I seldom employ them, and am somewhat skeptical as to the diagnosis and treatment of high-lying disease of the rectum which we hear of being effected by their means." His further statements that bougies are of little use for diagnostic purposes, although often of service in the treatment of stricture which

is within reach of the finger, and that the attempt to locate by a bougie a stricture too high to be felt with the finger is highly dangerous, will doubtless be concurred in by many surgeons who might not perhaps go so far as to endorse the view of Syme, expressed long ago, that "There is good reason to suspect the honesty of a man who pretends to enter a stricture which is beyond the reach of the finger."

In proctitis the sound advice is given to empty the canal first by simple purgatives—calomel or castor oil—rather than by enemas (which are painful, and may be infection carriers), and to employ the latter later as sedatives or antiseptics, or as both.

His experience with the immediate closure of fistulas by suture has been more satisfactory than has that of the majority of surgeons. He says: "If sufficient care is taken the great majority of cases of fistula can be so closed," that is, with prompt union and without the necessity for re-opening. He has been either very fortunate or exceptionally skilful. He adds, however, that to effect complete cure in a complicated case is a difficult and tedious operation demanding the exercise of considerable patience and attention to minute details. "It is only by thoroughness that one can hope to cure such a case at a single operation." There can, at least, be no doubt as to the accuracy of this assertion.

In the treatment of stricture, he very properly puts dilatation first, and relegates proctotomy—either linear or by external incision—to those cases in which efficient dilatation (preferably by Hegar's dilators) cannot be carried out and excision is impossible. In fissure due to anal "tags"—"sentinel piles"—he has found that moderate dilatation and the removal of the "tag" (usually a torn-down anal valve) by a V-shaped incision with the base toward the ulcer, supplemented by curetting of the latter if unhealthy granulation tissue is present, have been satisfactory in a large number of cases, neither forcible dilatation nor incision of the sphincter being necessary.

The chapter on prolapse contains an excellent summary of all the modern operations of proctopexy, but scarcely enough emphasis has been placed upon the use of the various cauterants, which require no special operative skill, and give good results in average cases.

In the treatment of hemorrhoids, after enumerating the various methods—caustics, injections, electrolysis, the clamp and cautery, excision of the pile-bearing area, etc.—he says that after twenty years' experience and a fair trial of each method, he has come very definitely to the conclusion that by far the best way of removing each separate pile is by a combination of ligature, crushing, and excision. He describes this method in much detail, but it does not differ materially from that of Allingham, in which the ligature is the essential feature of the operation. It has long been in use in this country, and preferred by many surgeons. Cancer, colotomy,

wounds of the rectum, etc., are satisfactorily dealt with on conventional lines.

The author's style is simple and direct, although there are occasional inelegancies that should have been caught in the proof-reading; *e. g.*, "Rectal fistulæ present themselves to our consideration in considerable variety, and from their great frequency and the discomfort they produce, constitute a subject of great interest to the surgeon. It is, therefore, to be little wondered at that, in looking through the voluminous literature on this subject, the names of many of the great masters of surgical art are to be found." These, however, are of minor importance, and the book—which is handsomely made up—constitutes a welcome and valuable addition to the literature of the subject.

J. W. W.

THE NATIONAL STANDARD DISPENSATORY: Containing the National History, Chemistry, Pharmacy, Actions, and Uses of Medicines, including those recognized in the Pharmacopœias of the United States, Great Britain, and Germany, with many references to other Foreign Pharmacopœias. In accordance with the Eighth Decennial Revision of the U. S. Pharmacopœia, by authorization of the Convention. By HOBART AMORY HARE, B.Sc., M.D., Professor of Therapeutics and *Materia Medica* in the Jefferson Medical College, Philadelphia; CHARLES CASPARI, JR., Ph.G., Phar.D., Professor of Theoretical and Applied Pharmacy in the Maryland College of Pharmacy, Baltimore; and HENRY H. RUSBY, M.D., Professor of Botany and *Materia Medica* in the College of Pharmacy of the City of New York. With the assistance of Edward Kremers, Ph.D., Daniel Base, Ph.D., and Joseph F. Geisler, Ph.C. Second edition; pp. 2050; 478 illustrations. Philadelphia and New York: Lea & Febiger, 1909.

THE *National Standard Dispensatory* is truly an encyclopedic work. Its general scope, its usefulness, its indispensability are commonly conceded, so that chief interest centers in the publication of a new edition and in how near it attains to that which it professes.

The volume comprises three major departments—pharmacognosy, pharmacy, and therapeutics. Professor Rusby has contributed the sections on pharmacognosy, in which he discusses drugs of great as well as drugs of minor importance. In the discussion of additional species, he refers to the principal economic members of the groups, so that the book is a fair index to the economic botany of all the more important families of medicinal plants. Sufficient information for the practical identification of drugs has been given, rather than full technical descriptions. The illustrations of drugs

have been drawn so as to represent their appearance as they occur in commerce. In order that the reader may find any name which may be encountered in the descriptions of vegetable drugs, nearly all recorded common names of drugs or medicinal plants have been given, and, in addition, all botanical synonyms.

Professor Caspari, in the pharmaceutical sections, has given full information regarding methods and products, with descriptions and explanations of the most approved apparatus and tests—of the greatest value to druggists. Not only have the facts contained in the United States Pharmacopœia been introduced, but also the important facts contained in the new editions of the chief foreign Pharmacopœias. The subjects of alkaloids and fixed and volatile oils have been considered with special detail, and much additional matter relative to new synthetic and other remedies has been incorporated in the book. Valuable assistance in these sections has been rendered by: Professor Base, who has prepared the articles on inorganic chemicals; Professor Kremers, who has prepared the articles on volatile oils and their constituents; and Professor Geisler, who has prepared the articles on organic chemicals.

Professor Hare, in the sections on therapeutics, gives a direct and compact presentation of the actions and uses of drugs—of the greatest value to the physician.

As compared with the former edition, the present is 160 pages larger, embraces 200 new articles, and has been carefully revised throughout. It contains the complete Food and Drugs Act and Regulations, together with official decisions necessary to their interpretation; the National Formulary in abstract, as well as many unofficial formulas widely in use; every article mentioned in the United States Pharmacopœia, with necessary comments and explanations, as well as all the important unofficial drugs and preparations of value; and the Pharmacopœias of Great Britain and Germany, as well as many references to other Pharmacopœias. In an appendix much useful information of a miscellaneous character has been collected. There is, finally, a general index of 121 triple-column pages, which contains the names of drugs and other substances used medicinally in English, French, German, Italian, Spanish, and Latin; and a therapeutic index of 21 triple-column pages, in which, under the names of diseases, are listed all drugs useful in treatment—a repertory of therapeutics of the greatest value to the general practitioner in his daily work.

The *National Standard Dispensatory* assuredly is of the utmost utility to the physician and the apothecary—to all, in fact, who are concerned in any way with drugs and other medicinal remedies. In its new and revised dress, its field of usefulness has become broadened and its value enhanced. Undoubtedly it will long remain the court of final resort in matters relating to pharmacognosy, pharmacy, and therapeutics.

A. K.

THE TREATMENT OF THE DISEASES OF CHILDREN. By CHARLES GILMORE KERLEY, M.D. Philadelphia and London: W. B. Saunders Co., 1907.

IN the opening chapter the author delivers his opinion in no uncertain terms on "the therapeutic doubt existing at the present time." "Therapeutic nihilism," he says, "as far as pediatrics is concerned, means ignorance and incompetency. The time when a physician can make a diagnosis, and cease his interest in the treatment of the case is past." No detail of treatment is too insignificant for the author's consideration and nothing is left to the reader's imagination. We do not find such phrases as "meeting the indications as they arise," "symptomatique" or "supportive treatment" and the like, which are found so plentifully in many systematic text-books. A very large share of the book is naturally devoted to dietetics, especially infant feeding. In his treatment of this important subject the author differs from many others, chiefly in that he does not limit himself to the description of the best method of substitute feeding only, but, recognizing the impracticability of attempting to prescribe ideal milk mixtures in a great many cases, especially in dispensary practice, provides for this contingency accordingly. Thus dispensary patients unable or unwilling to spend even the small sum of eight cents a day for the baby's milk, or who have no ice-box in which to keep milk in hot weather, are "put into the condensed milk class," the fat deficiency being made up during the colder months by giving cod-liver oil. Each article in the portion devoted to the treatment of special diseases begins with a brief enumeration of the salient symptoms, without any attempt to go into the question of diagnosis, except in a few instances in which the exigencies of the subject render a brief discussion of the differential diagnosis imperative. The actual number of drugs advised in the entire book is small, and many prescriptions are repeated again and again for different diseases. Calomel is not advised nearly so frequently as in most text-books, and its use in some conditions in which it is customarily recommended is absolutely condemned. Castor oil is the author's favorite laxative, and he gives it in large doses. Strophanthus rather than digitalis is advised as a heart stimulant for children on account of the great susceptibility of the digestive tract and the paramount importance of keeping it in working order. Nitroglycerin is also recommended with much insistence in cases showing cyanosis. Very definite directions are given in every instance in regard to dosage, method and time of administration, and length of time during which the exhibition of the drug is required. Lavage, gavage, the preparation and methods of administering laxative and nutritive enemas, hydrotherapeutic procedures, and other practical methods of treatment are explained

in detail and illustrated whenever necessary with photographs. Regarding the practical value of the book there can be only one opinion.

R. M. G.

A TEXT-BOOK OF GENERAL PATHOLOGY. By J. MARTIN BEATTIE, M.D., Professor of Pathology and Bacteriology in the University of Sheffield, and W. E. CARNEGIE DICKSON, M.D., Lecturer on Pathological Bacteriology in the University of Edinburgh. Pp. 475; 166 illustrations. Philadelphia: P. Blakiston's Son & Co., 1908.

DRS. BEATTIE and DICKSON seem to have found some excuse for preparing an additional book on pathology in the fact that it is based upon the teaching of the Edinburgh school, and that some fundamental points, which have been taught at Edinburgh for years, have not elsewhere received sufficient attention. Two are mentioned specifically: infarction and the relation between certain diseases of the kidney and arterial degeneration. Overlooking this perhaps excusable evidence of insularity, one may say that in the book the main facts of general pathology are well epitomized and set forth in a manner adapted for ready assimilation by the student. Bacteriology has been, advisedly, omitted, since it constitutes a distinct subject, albeit inseparable from pathology; the microscopic anatomy of diseased structures has been, inadvisedly, discussed too briefly. It is quite true, as the authors state, that descriptive writing cannot be substituted for the actual specimen and the microscope, but the study of the specimen and the interpretation of the lesions are much facilitated by a lucid description. This, however, scarcely detracts at all from the value of the book, which may be cordially recommended to the student. A companion volume on special pathology is promised shortly.

A. K.

GREEN'S ENCYCLOPEDIA AND DICTIONARY OF MEDICINE AND SURGERY. Edited by J. W. BALLANTYNE, M.D. In ten volumes. Edinburgh and London: William Green & Sons; Chicago: W. T. Keener & Co., 1908.

WE have had occasion several times in the past to comment very favorably upon the earlier volumes of this really excellent *Encyclopedia of Medicine and Surgery*. The work is now completed in ten volumes. Designed to replace the old *Encyclopedia Medica*, this new work contains within its ten volumes not only almost all the articles (revised and brought up to date) that were published in the thirteen volumes of the older work, but also a large number of new

articles on subjects dealt with only cursorily or not at all in the original issue: it contains more than twice as much material—a total of 11,843 articles, of which 609 constitute the encyclopedia and 10,366 the dictionary, while 868 are paragraphs intermediate in size. Aside from mere numbers, the longer articles, as a rule, are of considerable merit, reflecting accurately and in sufficient detail the present state of medicine. The dictionary part of the work comprises only definitions; as we have already said, it would have been materially improved by the incorporation of derivations, orthographical variants, and pronunciations. As a whole, however, the work is complete and authoritative, and may be cordially recommended to the profession as fully meeting the claims of the publishers that it constitutes in itself a complete and reliable medical and surgical library.

The publishers purpose shortly to issue a supplementary volume, which they announce as a *Quinquennium of Medicine and Surgery*, since it will contain a record of the advances made in medicine and surgery during the five years that have elapsed since the beginning of the publication of the encyclopedia. The editor promises that this will be something more than a record of the work of five years in medicine: that it will attempt to place new methods and new views in their proper perspective, and will endeavor to distinguish between what is new and of value and what is only novel. Assuredly it will be awaited with interest.

A. K.

THOMAS LINACRE. By WILLIAM OSLER, M.D., F.R.S., Regius Professor of Medicine in the University of Oxford, England. Pp. 64; 11 plates. Cambridge: at the University Press, 1908.

AN ALABAMA STUDENT AND OTHER BIOGRAPHICAL ESSAYS. By WILLIAM OSLER, M.D., F.R.S., Regius Professor of Medicine in the University of Oxford, England. Pp. 334. Oxford University Press, 1908.

THE Sage of Oxford, as he himself acknowledges, has, as a recreation, indulged a life-long interest in biography, and has added thereto a strong conviction of its educational value. In consequence, the literature of medicine, and, indeed, literature in general, has been much enriched by the results of his delvings into the records of the past. These are scattered throughout many periodicals; but some time ago some of them were collected in book form. Now we are thankful for a delightfully told appreciation of Linacre, comprising the Linacre Lecture for 1908, and a volume that takes its title from one John Y. Bassett, a pioneer of Alabama in the early part of the last century. Other of the essays concern Thomas Dover, described as a physician and buccaneer; John Keats, the apothecary poet; Oliver Wendell Holmes, John Loeke, Elisha Bartlett, a Rhode

Island philosopher; William Beaumont, a backwood physiologist; Louis' influence on American medicine, William Pepper, Alfred Stillé, Sir Thomas Browne, Fraseatorius, and Harvey and his discovery. To all, but perhaps most to the younger members of the profession, these essays should prove a source of inspiration as well as enlightenment. They reflect their author, always a scholar and entertaining, who sees truth and merit, even when more or less concealed by dross, and tells its story with discernment and judgment.

A. K.

SPRUCE AND ITS TREATMENT. By W. CARNEGIE BROWN, M.D., M.R.C.P. Pp. 259. London: John Bale, Sons, & Danielsson, Limited, 1908.

DR. BROWN furnishes an interesting and instructive account of sprue, otherwise known as psilosis, chronic tropical diarrhoea, endemic enterocolitis, etc., that should prove of value to all practitioners in the tropics and those who have to deal with patients returned from the tropics, in whom it is becoming increasingly prevalent. There are chapters on the history and literature, the symptoms and signs, the morbid anatomy, pathology, diagnosis, and treatment. The last mentioned is discussed in exhaustive detail—more than one-half of the book being devoted to it. A milk diet, a milk and fruit diet, and a meat diet, in the order named, are believed to constitute the best treatment. Little trust is placed in drugs.

A. K.

NERVOUS AND MENTAL DISEASES. By CHARLES S. POTTS, M.D., Professor of Nervous Diseases in the Medico-Chirurgical College, Philadelphia. Second edition; pp. 570; 142 illustrations. Philadelphia and New York: Lea & Febiger, 1908.

THE first edition of Potts' *Nervous and Mental Diseases* commended itself to a large circle of readers on account of its clear and concise description of clinical conditions, the inclusion of a large amount of essential facts, and the omission of facts of more academic interest than of practical importance. The present edition has been thoroughly revised. The book has been enlarged by about 100 pages, a number of new colored plates have been added, and the section on mental diseases has been practically rewritten to make it conform to the generally accepted and advanced teachings of the day. All the commendable features of the first edition are found in the second—amplified and expanded, so that the book well fulfills its purpose of a manual. It may be confidently recommended as an excellent student's book, and it may also be referred to with

advantage by those in practice desirous of being quickly informed of the salient features of the many disorders of the nervous system and the mind.

A. K.

THE TREATMENT OF FRACTURES, WITH NOTES UPON A FEW COMMON DISLOCATIONS. By CHARLES LOCKE SCUDDER, M.D., Surgeon to the Massachusetts General Hospital; Lecturer on Surgery in the Harvard University Medical School. Sixth edition; pp. 635; 856 illustrations. Philadelphia and London: W. B. Saunders Co., 1907.

THE latest edition of this masterly book follows closely upon its predecessors. Compared with the fifth edition, published one year ago, it shows thorough revision and the addition of sixty pages of text and twenty illustrations. The additions to the text consist of a moderately full description of the treatment of certain closed fractures by operation and also of old fractures at the lower end of the radius; a few other operative procedures also are described. Whitman's method in the treatment of fractures of the neck of the femur by forcible abduction and immobilization with or without traction is fully discussed. Especial attention in this edition has been paid to obstetric skull fractures, to fractures of the zygoma, of the malar bone, of the superior maxilla, of the head and neck of the radius, and of the carpal scaphoid; and a discussion of Volkmann's contracture with illustrations has been introduced. Dislocations at the elbow, and at the acromioclavicular joints are more thoroughly treated. A number of new x-ray photographs have been added. The present volume continues to be a guide to the practitioner and student in the treatment of fractures and dislocations, and cannot be too highly recommended. J. A. K.

A MANUAL OF MIDWIFERY. By THOMAS WATTS EDEN, M.D., F.R.C.P. (Lond.), F.R.C.S. (Edin.), Obstetric Physician and Lecturer on Practical Midwifery and Gynecology, Charing Cross Hospital, London. Second edition. Pp. 555; 42 plates and 236 illustrations in the text. Chicago: W. T. Keener & Co., 1908.

THIS volume is a satisfactory treatise on obstetrics from the standpoint of the student. It is not a book which will be found of value to the practitioner of experience as a reference volume. In the main the subject is adequately covered, although there are some statements to which it is necessary to take exception, as for instance, the advice that the urine should be examined monthly during the last three months of pregnancy. If this were a first, instead of a second

dition; we should feel that the author had failed to detect error in his proofreading, since there can be no doubt that criminal negligence is not too harsh a charge if the urine be not examined oftener than the above instructions call for. Again, we cannot agree with him that the Champetier-de-Ribes bag has displaced all other hydrostatic dilators, or, as is implied by inference, that the Milne Murray foreeps is to be preferred to the Tarnier model. As the book does not pretend to be an operative manual, the slight and wholly incomplete account of the vaginal Cesarean section may be excused. In his description of abdominal Cesarean section the author advocates the incision of the uterus and its evacuation, before bringing it outside of the abdomen. His method of suture, while better than some advocated in the past, is not entirely satisfactory. It gives satisfaction to find that he warns against profound anesthesia at the time of delivery; that the fallaciousness of the menstrual history as a determining diagnostic point in the diagnosis of extra-uterine pregnancy is insisted upon; that he warns against "supporting the perineum," but insists upon preserving good flexion of the head until the occipital protuberance has escaped; and that he demands that one hour be allowed to elapse before the performance of the Credé method of placental expression. We can recommend the book to the class of readers for whom it was prepared. W. R. N.

A TEXT-BOOK OF DISEASES OF WOMEN. By CHARLES B. PENROSE, M.D., Ph.D., formerly Professor of Gynecology in the University of Pennsylvania, Philadelphia. Sixth edition. Pp. 536; 225 illustrations. Philadelphia and London: W. B. Saunders Co., 1908.

As the previous editions of this well-known book have been thoroughly reviewed in the columns of this journal, it hardly seems needful to give it extended consideration at the present time, more particularly since the work in the earlier editions was so well and completely done that but little has been added in those of a more recent date. The book was prepared for the use of students; their verdict is found in the fact that in the past eleven years six editions have been necessary to meet the demand. One of the most admirable points of the book is its accomplishment of the purpose avowed in its preface. In the introduction the author states his purpose to write a book that will present the best teaching of modern gynecology untrammeled by antiquated methods of treatment or theories. Those of us who have had occasion practically to commit the book to memory, in the teaching of various classes of undergraduates in the University of Pennsylvania, will bear willing testimony to its conciseness of statement and clearness of description. We believe from personal experience that it is one of the best books published for the use of the undergraduate. W. R. N.

PROGRESS
OF
MEDICAL SCIENCE.

MEDICINE.

UNDER THE CHARGE OF
WILLIAM OSLER, M.D.,
REGIUS PROFESSOR OF MEDICINE, OXFORD UNIVERSITY, ENGLAND,
AND
W. S. THAYER, M.D.,
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An Axillary Diastolic Murmur in Aortic Insufficiency.—R. COLE and A. B. CECIL (*Johns Hopkins Hosp. Bull.*, 1908, xix, 353) note that previous work has shown that the point of maximum intensity of the aortic diastolic murmur is not constant, but varies under different conditions, most authorities placing it in the third and fourth interspace to the left of the sternum and near its margin. Cole and Cecil having noticed the frequency of a diastolic murmur at the apex and in the axilla made a careful study in a number of cases of aortic insufficiency as regards these points of transmission. In all but 2 of 17 cases examined the diastolic murmur was heard outside the apex in the axilla. At times the murmur in the axilla may be of secondary or even, as in 2 cases of maximum intensity, that is, in passing from the point of maximum intensity close to the sternal border, the murmur diminishes in intensity as the apex is reached and then becomes louder in the axilla. Cole and Cecil think that this axillary murmur is of exactly the same kind and quality as that heard at the base; and that inasmuch as it is easily traceable by careful study with a mapping out of the distribution of the aortic diastolic murmur, it cannot be a Flint murmur or a true stenotic murmur transmitted out into the axilla. For this murmur they suggest the term “aortic axillary diastolic” murmur.

Paralysis of the Left Auricle in Mitral Lesions.—JOACHIM (*Deut. med. Woeh.*, 1908, xxxiv, 2207) calls attention to the fact that the presystolic murmur of mitral stenosis or the presystolic intensification of a diastolic murmur often disappears when compensation is lost. He has studied the action of the left auricle in four such cases by means of an oesophageal

balloon connected with a tambour. In the tracings which were obtained, Joachim finds no evidence of any auricular contraction. He therefore believes there is a paralysis of the auricle, thus proving Mackenzie's explanation of the disappearance of the presystolic murmur to be correct. His work confirms that of Rautenberg.

The Contrast in the Excretion of Chlorine in Influenzal Pneumonia and in Ordinary Acute Lobar Pneumonia.—L. G. ROWNTREE (*Johns Hopkins Hosp. Bull.*, 1908, xix, 367) notes that the retention of chlorine in cases of influenzal pneumonia is not nearly so marked as is usually the case in acute lobar pneumonia. Uncomplicated influenzal pneumonia may show a normal daily excretion of chlorine, and if reduced, the reduction may not be very great and does not remain low. There is a tendency for the amount of chlorine in 10 c.c. of urine and the total daily output of chlorine to run more or less parallel in their fluctuations. The quantity of urine during the course of an influenzal pneumonia is not greatly diminished, but shows a slight tendency to decrease in quantity during convalescence, while the amount of chlorine may be steadily increased to normal. In influenzal pneumonia a large quantity of urine is not usually associated with a markedly low amount of chlorine in 10 c.c. of urine, as is usually the case in ordinary lobar pneumonia.

A New Sign for the Detection of Malingering and Functional Paresis of the Lower Extremities.—C. F. HOOVER (*Jour. Amer. Med. Assoc.*, 1908, li, 748) asserts that as this sign of "complimentary opposition" depends on a normal function always exhibited in healthy persons and invariably present in the sound leg by patients suffering from hemiplegia or paresis of the other, due to some pathological lesion, it is of some importance and of very broad application. The sign is as follows: If a normal individual lying in a dorsal position on a couch be asked to lift one foot with the leg extended, the heel of the other foot will be observed to dig or press into the couch and the extent of pressure may be determined by placing the hand under the tendo Achillis of that side; thus the heel of one foot is employed to fix a point of opposition against the couch during the effort at lifting the other leg; this always occurs if a healthy person makes a free and uninhibited effort to raise the leg. In the reverse order the same principle holds true, for if a person is requested to press the foot or leg against the couch there will be a counter lifting force in the other leg. In patients with hemiplegia or monoplegia of one leg, in attempting to elevate the extended and paralytic leg from the couch the normal foot exhibits the same sign, as above, whether there is any voluntary muscular strength exhibited or not in the affected side. On lifting the normal leg against resistance, however, he will exhibit an opposition with the paralytic leg directly proportional to the voluntary muscular strength he is able to employ when a display of voluntary muscular power in the paralytic leg is exacted. Hoover has found this sign present in a large number of hemiplegic patients, and reports four instances of supposed paresis in malingeringers and hysterical subjects, with a quick disproof of their supposed affection by this sign. In these cases it is important that the person examined be unfamiliar

with the test and that his attention fixed on the paralytic leg so that no voluntary cerebral inhibition on his part may interfere with the test.

Working with this same sign, J. LEHERMITTE (*Sem. méd.*, 1908, xxviii, 565) reports upon its use in a number of cases of organic hemiplegia and confirms Hoover's assertions. He thinks that the sign throws much light on the mechanism of hysterical paralysis, as the feeling of the movements of the muscles by the hand under the leg, even in those cases incapable of any volitional movement, shows that in hysteria the subconscious movements are retained unimpaired, while those under control of the will only are suspended. The mechanism of hysterical paralysis is of a different order from that of organic paralysis and in the first the trouble is not the consequence of a functional disorder limited to a definite anatomical system, but is the result of a psychic disturbance, and thus is essentially the creation of the mind. He thinks this sign is due to a natural subconscious effort to maintain static symmetry in the pelvis as the leg is lifted. The digging of the leg into the couch does not help to lift the leg, but helps to maintain this balance.

Alimentary Galactosuria in Icterus.—BAUER (*Deut. med. Woch.*, 1908, xxxiv, 1505) published observations on alimentary galactosuria in normal individuals and in many diseased conditions, showing that galactosuria is present very frequently in cases of cirrhosis of the liver. His experiments have been continued in jaundiced patients. He gives 40 grams of galactose in 400 to 500 c.c. of tea early in the morning on the fasting stomach, and then estimates quantitatively the amount of galactose which reappears in the urine. He finds that alimentary galactosuria is a constant symptom of catarrhal jaundice and cirrhosis of the liver, while in normal individuals and a great variety of diseases it is lacking. In jaundice due to gallstones and to malignant disease, it is usually absent, and when present, is very slight. Because of the difficulty of diagnosis and prognosis in many cases of jaundice the method may be of value.

The Increase of the Gastric Secretion during Menstruation.—WOLPE (*Deut. med. Woch.*, 1908, xxxiv, 2208) has made a comparative study of the gastric juice during and after menstruation in a variety of stomach diseases and in normal individuals, and has obtained the following results: (1) At the time of menstruation the free hydrochloric acid and total acidity of the gastric juice are increased. (2) The secretory activity of the stomach is also stimulated and more gastric juice is produced than normally. In many cases in which hyperssecretion already existed a true gastrosuccorrhea ensues temporarily. (3) The motor power of the stomach is considerably lessened during menstruation. (4) The changes enumerated are doubtless of a purely nervous origin, reflex in nature. The most important practical lesson to be learned from these studies is to avoid the pre-menstrual and menstrual periods in giving test meals for diagnostic purposes.

The Flexor Reflex of the Fingers in Hemiplegia.—JACOBSON (*Deut. med. Woch.*, 1908, xxxiv, 1971) refers to the very great value of the

Babinsky reflex in the diagnosis of lesions of the pyramidal tracts, and remarks that little attention has been given to the reflexes of the upper extremity. Those which have thus far been studied have not a value commensurate with the Babinski plantar reflex. Jacobsohn has studied the fingers in hemiplegies and finds a volar flexion of the fingers on the affected side comparable to the dorsal flexion of the toes in such patients. When the volar flexion is very marked, the finger tips are pressed against the palm of the hand. In such cases the patient is able to extend the finger slightly, if at all, since a permanent contracture exists. In other cases the flexion is less marked and often is entirely lacking. The freedom of motion of the fingers and hands is usually directly proportional to the degree of contracture. To elicit the reflex which Jacobsohn has discovered in the fingers of hemiplegies, one proceeds as follows: The examiner stands on the side of the patient which is affected, and the patient's arm rests on the hand of the examiner so that the thumb is on the outer side. One now taps on the lower end of the radius or in its neighborhood, and if the reflex is positive, a definite flexion of the fingers, especially of the terminal phalanges, results. In other cases (negative) the fingers remain extended. Jacobsohn finds the reflex constantly present in typical cases of hemiplegia, both mild and severe, and it is especially helpful in the mild ones. The reflex runs parallel with the Babinski sign in hemiplegia. In some cases of neurasthenia in which all the reflexes are exaggerated, Jacobsohn has found a slight flexion of the finger and hand after percussion of the radius. But this is eliminated when the patient is told to extend the fingers well.

Hysterical Paroxysmal Cœdema.—F. H. EDGEWORTH (*Quart. Jour. Med.*, 1909, ii, 2135) attempts to differentiate from the large and indiscriminate class of cases, sometimes called "angioneurotic cœdema," a group which is of hysterical origin and which is characterized by the repeated occurrence of transitory cœdema affecting "geometrical" or segmental areas of the body surface, associated in some cases with disturbance of sensation, hysterical in type. Edgeworth reports several such cases in which were presented the features of a subcutaneous cœdema of fairly sudden onset, the whole area becoming affected uniformly at the same time; the surface of the skin was generally natural in color, but in some instances was hyperemic or white and cold or purplish; the cœdema at its height was firm and non-pitting, later during subsidence it became softer; the edge was always abrupt. There was no pain, only a mechanical inconvenience, and the duration was usually from eight hours to two days. The areas corresponded to the natural divisions of the body, *e. g.*, the mammal, or with areas covered by articles of clothing, stockings, socks, gloves, etc., that is, with the areas called "geometrical" or segmental by writers on hysterical phenomena. There were some sensory disturbances. This condition must be differentiated from the hysterical chronic cœdema of Sydenham and Chareot and the angio-neurotic cœdema so well described by Milton, Quincke, and Osler. But by careful attention to the "geometrical" type of the area affected, the abrupt edge, the disturbances in sensation, lack of gastro-intestinal crises, or the presence of other viscerai manifestations, Edgeworth suggests that cases of paroxysmal cœdema may be divided into

two categories—those of Quineke's œdema (angioneurotic œdema) and those of hysterical origin. The former are allied to Henoch's erythema, the latter to hysterical chronic œdema. The former are probably due to some blood change and the latter to some disturbance in the central nervous system.

Hemoglobin Estimation and the Functional Value of the Hemoglobin.—OERUM (*Deut. med. Woch.*, 1908, xxxiv, 1225) has made comparative studies of the hemoglobin of normal individuals in Berne, Switzerland, and in Copenhagen. In his studies he has used the same Sahli standard tube and compared the results obtained with the von Fleischl-Miescher instrument. In Berne he found that twenty men between the ages of nineteen and twenty-two years had an average hemoglobin of 80.7 per cent. (Sahli). Reckoned in coloring matter for 100 c.c. of blood, this equals 13.8 per cent. hemoglobin. In Copenhagen the average of thirty students was 99.6 per cent. (Sahli). Thus there is a marked difference in values in Switzerland and Denmark with the same Sahli tube. But the Miescher apparatus gave equal readings in both cities. The difference is to be explained by the difference in elevation above the sea. By comparing the readings obtained with the Sahli and Haldane instruments Oerum finds that a given quantity of hemoglobin may show greatly varying powers for absorption of carbon monoxide. Therefore, while the color intensity of the blood of normal individuals in both Berne and Copenhagen is alike, the hemoglobin content of the bloods is different. Comparing the results obtained with Sahli and Haldane's instruments, Oerum reckons the so-called functional value of the hemoglobin, to which he attaches considerable importance.

The Pathogenesis of Ochronosis.—GROSS and ALLARD (*Arch. f. exp. Path. u. Pharm.*, 1908, lxiv, 284) have studied ochronosis experimentally in connection with a case of ochronosis and alkapturia which they have observed recently. From the frequent association of the two conditions they assume that homogentisic acid bore a direct relationship to both. They were, however, unable to extract this acid from cartilage or any other tissue. By placing pieces of cartilage from dogs and calves obtained immediately after death in homogentisic acid solutions (1 to 10 per cent.), and keeping this at room temperature three to six weeks with chloroform to prevent decomposition, they found the characteristic color changes of ochronosis produced in the cartilage. At first a grayish color appeared on the surface, which gradually increased in intensity and penetrated to a greater depth, until finally the cartilage was deep black. Microscopically, the cartilage was similar to that obtained from patients with ochronosis. Connective tissue which was attached to the cartilage remained uncolored.

The Treatment of Chorea by the Intraspinal Injections of Magnesium Sulphate.—G. MARINESCO (*Sem. med.*, 1908, xxviii, 553) notes that the beneficial effects in tetanus from the injection of magnesium sulphate reported in the literature led him to use the same in cases of severe chorea, with very beneficial results. The duration of the disease was markedly lessened and there has been no return of the trouble since the treatment.

The injection was 3.5 c.c. of a 25 per cent. solution; the patients were girls between twelve and twenty-two years of age. The sedative action of the drug was noticed a few hours after injection, the symptoms quickly subsided, subsequent injections being required only a few times. The slight untoward effects noted quickly subsided, and no serious results followed. The headaches and pains can be best overcome by a small preliminary dose of morphine. Marimeseo says that the best solution for injection is an isotonic one with the freezing point at 0.56, and he is convinced that this method will be very successful in certain well-selected cases.

S U R G E R Y.

UNDER THE CHARGE OF

J. WILLIAM WHITE, M.D.,

JOHN RHEA BARTON PROFESSOR OF SURGERY IN THE UNIVERSITY OF PENNSYLVANIA;
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AND

T. TURNER THOMAS, M.D.,

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Operations on Malignant Tumors of the Stomach and Their Final Results.

—GOLDSCHWEND (*Archiv f. klin. Chir.*, 1908, lxxxviii, 218) says that 333 cases of benign and malignant diseases of the stomach (chiefly ulcers and cancers), were operated on in the surgical department of the Linz General Hospital in the last twenty years. About two-thirds of these were operated on in the last ten years. Notwithstanding all the efforts that have been made to establish the early diagnosis of cancer of the stomach, it is generally conceded that although it may be suspected frequently it can not be positively diagnosed. In a large number of cases the tumor is first recognized only when it is too far advanced to permit a radical removal. The total mortality from operation in 179 cases of cancer of the stomach, radical and palliative, was 35 per cent. That for resection and gastro-enterostomy was approximately the same (36 per cent. and 35.5 per cent.). It should be borne in mind, however, that in many cases in which gastro-enterostomy was the operation performed, the very advanced stage of the disease influenced the mortality very unfavorably. The average duration of life (recurrence) was fifteen months and twenty days. After gastro-enterostomy it was six months and ten days. After resection, 19 (23 per cent.) were discharged cured. 11.4 per cent. of the whole number operated on remained cured (the oldest remaining eight years free of recurrence). Resection by Billroth's second method, with anterior antecolic gastro-enterostomy, gave the best results (mortality, 15 per cent.). In palliative operations, on the contrary, posterior retrocolic gastro-enterostomy is to be preferred. Careful clinical examination of the stomach is necessary in order that the case may be passed over to the surgeon as early as possible. Whenever a carcinoma is suspected an exploratory laparotomy should be done.

The Mechanics of the Cerebrospinal Fluid and its Employment in Lumbar Anesthesia.—PROPPING (*Mitt. a. d. Grenzgeb. d. Med. u. Chir.*, 1908, xc, 441) makes the following practical applications of the results of his study of this subject. Elevation of the pelvis, just as does the sitting position, causes a movement of the cerebrospinal fluid in the subarachnoid space, although this is relatively slight. We have no means of determining the quantity of cerebrospinal fluid present or its distribution. It is advisable not to withdraw large quantities of the fluid, since we do not know in what relation the withdrawn fluid stands to the whole quantity present. We must have in mind, in every case, that the anesthetic, by means of the cerebrospinal fluid, reaches the medulla oblongata. How quickly it progresses in each case we do not know. If the anesthetic is a heavy solution of high specific gravity, the diffusion in the horizontal position occurs with relative rapidity. It would appear, therefore, that the head should be elevated after the operation to impede the rapidity of the diffusion. A prolonged elevation of the pelvis after the injection of a solution of high specific gravity, must be regarded as dangerous.

The Conjunctival Reaction of Tuberculin, its Supposed Dangers, and its Value in Surgery.—ZOEPPRITZ (*Mitt. a. d. Grenzgeb. d. Med. u. Chir.*, 1908, xc, 496) says that a 1 per cent. old tuberculin of Koch, with the established precautions, is without danger. The conjunctival reaction is positive in all uncomplicated, unopened cases of bone, joint, and glandular tuberculosis. In all unopened diseases of the bones, joints, and glands, when the proper technique is carried out and tuberculosis is not present in other parts, the negative result in the conjunctiva is of much importance. It shows that the local affection is not of a tuberculous nature. Oftentimes the strongly marked redness of the reaction is replaced by a more pale-brown color. In recent cases of unopened bone, gland, and joint disease, which give relatively acute symptoms, the pale later reaction obtained under the same precautions as above speaks with more certainty against tuberculosis. Genital tuberculosis comes, as a rule, into the stage of the pale reaction, so that in these cases only a negative result is conclusive. With the pale reaction one cannot exclude here the beginning stage of tuberculosis. In general tuberculosis, namely, of the peritoneum, intestines, lungs, and meningcs, as well as in miliary tuberculosis, the reaction is of little value. Little dependence is to be placed on it for fistulous or open tuberculosis.

The Indications for Operation in Biliary Lithiasis.—QUENU (*Rev. de chir.*, 1908, xxviii, 682), quoting Kehr, says that Riedel estimated that there were 2,000,000 cases of biliary lithiasis in the German empire; but that only 100,000 gave trouble. Kehr operated on only 1300 out of 4000 cases which came to him for consultation. The 2700 others he treated medically and expectantly. 80 per cent. of the patients who have had attacks of pain, according to Kehr, again became latent cases, which is equivalent to a cure. According to Riedel's figures, in 1000 cases of biliary lithiasis, 950 are latent and only 50 give symptoms. 80 per cent. of these may become latent later, so that only 10 of the 1000 cases merit operation, or 1 in 100. Quenu believes that stones in the

gall-bladder justify operation only when there are symptoms of complications or the exaggeration of habitual painful manifestations. In grave cases of suppurative or gangrenous perforative cholecystitis the operative mortality remains high. In the less acute, presumably not of the above types, the urgency of operation disappears. One can then, as in appendicitis, treat expectantly, that is, with rest, hot compresses, etc., but one should take into account that attack or a series of attacks in deciding the treatment later. The ease may end in a chronic empyema of the gall-bladder, and frequently does end in a chronic inflammation. Operation will then depend especially upon the constitutional symptoms. Repeated painful attacks, recurring at short intervals, and the resulting interference with work, and more particularly recurring fever from time to time, indicating a lighting up of an old chronic lesion, warrant operation. In hydrops of the gall-bladder the rule is to operate, but a sterile hydrops may give only mild disturbances. When the stone is in the common duct, operation is indicated as soon as a diagnosis of chronic obstruction can be made. In order to establish such a diagnosis one should wait until the acute symptoms have subsided, in order that an obstruction of the common duct may not be confused with an attack of angiocholitis associated with stones in the gall-bladder.

Multiple Perforations of the Intestine from Gunshot Wounds of the Abdomen.—SOURDAT (*Rev. de chir.*, 1908, xxviii, 733) says that multiple perforations of the intestines from gunshot wounds of the abdomen are frequent. Whatever their number, they are not beyond the resources of surgery. The early diagnosis of these lesions is difficult, sometimes impossible. We should look upon every gunshot wound of the abdomen as penetrating and complicated by visceral injury, especially by wounds of the intestine, unless we have absolute proof that it is not penetrating. Whenever possible, we should do a median, exploratory laparotomy, without regard to the seat of the wound. The intestine should be explored systematically in its whole extent, with as little evisceration as possible. After repair of the lesion a careful toilet of the peritoneum should be provided whenever there has been a considerable escape of feces.

Supernumerary Kidney Diagnosticated during Life.—CALABRESSE (*Ann. d. mal. d. org. génito-urin.*, 1908, ii, 1841) says that the literature on this subject is scanty. A woman, aged fifty-five years, had complained of epigastric pain for only two months. The pain was at times mild and at other times so acute that the pressure of the clothes could not be tolerated, and vomiting occurred. A movable right kidney which gave no pain was diagnosed. On the left side a similar condition of the kidney was discovered. On pushing this kidney back into the left renal fossa, there could be felt below its lower pole an oval body about the size of a chicken's egg, hard, smooth, mobile, and separated from the right upper body by an appreciable groove. The diagnosis of nephroptosis was easily made, but it was not easy to decide the character of the lower body. It was thought to be a supernumerary kidney. Operation was done only on the left side, as the symptoms appeared to come only from that side. A lumbar incision exposed the

kidney, and a small supernumerary kidney was disclosed below the lower pole of the upper or normal kidney. Both of these kidneys were attached to the abdominal wall by flaps made from the detached capsule and sutures. Complete cure followed.

Temporary Occlusion of the Colon for Resection or Shutting off the Function of the Lower Bowel.—WILMS (*Deut. Ztschr. f. Chir.*) says that our only method of excluding the large bowel, especially the sigmoid flexure and rectum, in inflammatory conditions, such as those from gonorrhœal, syphilitic, and dysenteric diseases, is by a colostomy. This can completely prevent the passage of the contents to the part below the colostomy opening only when an effective artificial anus is made. This means that a separating spur must be made between the two limbs of the bowel loop brought out and sutured to the margins of the abdominal wound. Wilms conceived the idea of providing a temporary complete occlusion of the bowel below the opening in the intestine. It would then be sufficient to make a lateral attachment of the bowel at the site of the opening in it to the abdominal wound. Later, when the necessity of the bowel occlusion and colostomy had passed, the occlusion could be removed and the fistula be given an opportunity to close spontaneously. In 8 cases Wilms proved the value of his method, which was carried out as follows: A rather strong piece of wire was bent into the shape of an ordinary hairpin, or a hairpin itself was employed. The part of the intestine below the site of the colostomy opening was drawn between the limbs of the pin so that one end of the pin passed through the mesentery and both ends lay on the same side of the mesentery. The two ends of the pin were then forced toward each other, by forceps or the fingers, tightly enough to close the lumen of the bowel effectively, but not so tight as to injure it. In order to provide continuous and equable pressure for the desired period, which might be weeks or months, the two ends of the pin were fastened together by a silk or linen thread wrapped around the ends of the pin. The thread was then tied to the loop end of the pin. The pin may be so placed as to be visible in the wound or, what is better, it may be buried in the wound and the ends of the thread left outside. Above, on the stomach side of the occlusion, a lateral colostomy was performed in the usual manner. The opening should be large enough to provide a free escape of the feces. Wilms opened the bowel twelve to twenty-four hours after the operation. When it is necessary to remove the occluding pin, the thread leading to the free ends of the pin was cut, and the end fastened to the loop end of the pin was drawn on and the pin thus removed. Wilms has employed this method with much satisfaction in the treatment of inflammatory conditions of the lower bowel and for the excision of carcinomas, the exclusion of the feces offering a very desirable advantage in either case.

A Contribution to the Etiology and Treatment of Inflammatory Stricture of the Rectum.—GAUDIANI (*Deut. Ztschr. f. Chir.*, 1908, cxi, 230) says that from the etiological standpoint the conclusion can be drawn that stricture of the rectum is not due to any one cause. Syphilis, gonorrhœa, and tuberculosis are the most common causes. A definite

dysenteric origin is difficult to establish. Gaudiani's observations and those of other writers show that the histological examination does not always lead to definite conclusions concerning the pathogenesis. The changes in the blood vessels observed by Gaudiani and Rieder point definitely to syphilis. Rectal tuberculosis is more frequent than has hitherto been observed. Gradual dilatation in mild cases and in the early stages gives good results. In advanced cases operation is the only choice, and this should consist almost always of resection or amputation. An artificial anus is necessary for relief in these cases.

The Treatment of Angioma with Frozen Carbonic Acid.—SAUERBRUCH (*Zentrbl. f. Chir.*, 1909, xxxvi, 1) reports his results from the application of a method observed in the Augustana Hospital in Chicago, where it was employed by Ochsner. A strong stream of carbonic acid gas from a tank, such as is used with the freezing microtome, was passed through a piece of gauze held in front of it. The rapid evaporation left on the gauze an even layer of white snow at a temperature of 79° below zero. A small piece of this snow was placed on the surface of the angioma and allowed to remain ten to twenty seconds. The cold produced a marked degree of contraction of the vessels and a circumscribed anemia of the tumor, which was surrounded by a hyperemic area. At the same sitting two or more applications of the snow were made in different places, but no bandage was applied. This treatment was repeated at intervals of eight to ten days until the tumor had disappeared. Sauerbruch has verified the method throughout. He saw two angiomas about the size of a dollar, one on the forehead, the other on the arm, become smaller after three treatments and completely disappear after five treatments, without leaving any scar. A large angioma at the root of the nose, which had shown only slight contraction after many treatments during a year, was strikingly improved after three treatments with the frozen carbonic acid. Other cases showed similar results. In large angiomas the snow should be applied for longer periods (thirty to forty seconds) and mild pressure should be employed. This leads to the formation of a slough which will be replaced by cicatrization in about eight days. The cosmetic effect is good and the method is painless. Sauerbruch has also employed it with good results in epitheliomas of the face.

Drainage of the Common Bile Duct after Operation.—KEHR (*Zentrbl. f. Chir.*, 1909, xxxvi, 3) says that by the usual methods of draining the bile ducts almost all the bile escapes externally and the intestinal tract is deprived of it, so that many patients operated on suffer severely. Recently Kehr has employed the following method in 10 cases: A thin rubber drainage tube of a T form is employed. The one end of the horizontal limb of the tube is passed about 2 cm. in the direction of the duodenal end of the common duct and 2 cm. in the direction of the liver. The vertical limb is brought out of the abdominal wound. The tube is fixed to the edges of the opening in the duct by two stitches. Considerable difficulty was experienced in removing the tube on account of the stitches and the branches of the T in the duct. Another difficulty was experienced in one case. The limbs of the tube were fused

together at their junction, and bile passing through and around the portion of the tube in the duct had dissolved the connection, so that on the withdrawal of the vertical portion the other piece remained in the duct, and had to be removed at a second operation. After this experience, for security, both portions were further united by a silk ligature. Kehr has further modified the tube so that the portion of the horizontal tube passing toward the hepatic duct is 1.5 em. long, and that toward the duodenum 0.5 em. This renders its removal more easy. The opening in the common bile duct is narrowed to the tube by suturing the opening in the duct on the side of the hepatic duct to the tube. In the first five days almost all the bile flows outward through the wound. On the sixth day the outside tube is clamped or tied shut, so that the bile is forced onward to the duodenum. This occurred in all the 10 cases. If there is an obstruction of the duct on the duodenal side the bile will escape from the external wound alongside the tube and the abdominal cavity will be protected by adhesions. The T tube is removed in ten to fourteen days. In the last case operated on, on the sixteenth day, the opening in the duct was closed, as was shown by the fact that no bile escaped.

Operations on the Biliary Passages.—MIZOKUCHI (*Deut. Ztschr. f. Chir.*, 1908, evi, 422) made a study of seventy operations on the biliary passages, performed by Professor Omohri at Fuokoki. He says that gallstone disturbances are much less frequent in Japan than in Europe and up to the present time relatively few operations have been done for them. The type of case differs also. According to German writers the stones are usually formed of cholesterol, women are the most frequent sufferers, and the stones are found most frequently in the gall-bladder. His experience with 41 cases of pure gallstones differed from this. Males were more frequently attacked than females, the stones were found much more frequently in the common duct and they consisted mostly of bilirubin and were very brittle. In 43 cases the stones were examined qualitatively. In 9, pure cholesterol stones were found, 6 in the gall-bladder and 3 in the common duct. Three intrahepatic stones were of bilirubin and were almost free of coloring matter; 17 of the 43 contained chiefly bilirubin calcium with traces of cholesterol and a calcium soap. The remaining stones were formed of a compound mixture. A pure mineral stone was not found, although in all there was some iron, and in most of them a surprising amount of copper. In 6 cases ascarides were found. In one the bile-stained worm was found in the cystic duct, and in another some time after operation a living worm escaped from the gall-bladder fistula. In a third, from the common duct filled with thick bile, there were removed five dead and one living worm; in a fourth, which came to autopsy eight days after operation, there were found three dead ascarides as well as gallstones in the bile passages of the left lobe of the liver. In a fifth case there was a living worm in the hepatic duct; and in the sixth there was found, adherent to the surface of a very large stone removed from the common duct, a dead worm. In another case, in which a choledochotomy was performed for severe colic, ascarides were found but no stone. Of the 41 patients operated on, 8 died, and of these,

in 4, stones were found in the liver. The preponderance of bilirubin stones is explained by the vegetable diet of the Japanese. Much tea is used and very little alcohol in the form of rice wine (sake). The frequency with which stones were found in the common duct and liver is explained by the late period in which the patients came to operation. Of the 41 pure gallstone cases, in 22, or 53.6 per cent., the stones were found in the common duct, and in 18, or 44 per cent., in the cystic duct or gall-bladder.

THE R A P E U T I C S.

UNDER THE CHARGE OF

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Further Observations on the Importance of Cellulose in the Diet of Diabetics.—SCHMIDT and LOHRISCH (*Deut. med. Woch.*, 1908, xlviii, 2012), in a previous communication (*Deut. med. Woch.*, 1907, xlvi), advocated the use of cellulose in the dietetic treatment of diabetics. In the present papers they reiterate their former conclusions with some additional observations. Their earlier observations were mainly with cellulose derived from white cabbage. They have found that a preparation of cellulose from agar-agar is better tolerated and supplies more nourishment than cellulose derived from white cabbage. The preparation is a yellow powder, a hemicellulose, neutral in reaction, smelling and tasting like malt. Dissolved in cold water, the preparation has a prompt reducing action and will deflect light slightly to the left, but is non-fermentable. After boiling or hydrolysis with hydrochloric acid light is deflected to the right, and tests show that the sugar formed is galactose. Their experiments showed that agar-agar formed galactose from the hemicellulose, galactan. This is very slowly broken up and absorbed, and this slow gradual assimilation is the principal reason for its toleration by the diabetic; 50 to 100 grams of the preparation of agar-agar will furnish 20 to 40 grams of galactan. Moderate doses give no ill effects, at most causing more or less fluid stools. Larger doses may cause diarrhoea and flatulence. They believe that 60 to 75 per cent. of the preparation is absorbed. No increase in the amount of sugar or acetone occurs in the urine after its use.

Gastric Ulcer.—KATZENSTEIN (*Berl. klin. Woch.*, 1908, xxxix, 1749) has performed some interesting experiments which, he thinks, add some facts to explain the etiology of gastric ulcer. In an earlier paper (*Deutsch. med. Woch.*, 1907, iii and iv) he has shown that the beneficial effect of gastro-enterostomy is largely due to the fact that alkaline fluids enter the stomach and thus favor the healing of the ulcer. In one of his experiments Katzenstein made two wounds, one in the stomach and the other in the bowel, and cauterized both with hydrochloric acid.

The stomaeh wound healed in two days, while the intestinal wound perforated. He thinks that this result indicated that the stomach possessed some protective substances against the action of hydrochloric acid. He stitched a loop of the intestine so that it projected into the stomaeh, and this loop was digested. A portion of the spleen similarly placed was also digested. On the other hand, a fold of the gastric mucous membrane or a piece of the duodenum resisted the action of the gastric juice. Similar experiments *in vitro* gave the same results. Portions of gastric or duodenal mucous membrane were not digested, while pieces of other tissues were. Furthermore, the presence of pieces of gastric mucous membrane served to protect other tissues against artificial digestion. Therefore he believes that even the dead gastric mucous membrane contains some substance which acts as an antiseptic agent. He has succeeded in isolating this protective substance or antipepsin. He believes that it may be of great value in the treatment of gastric ulcer on the assumption that there is a deficiency of antipepsin in that disease.

The Therapeutic Use of Bromides upon an Experimental Basis.—WYSS (*Med. Klin.*, 1908, *xlvii*, 1794) has performed experiments on animals producing serious symptoms by the administration of bromides. The animals develop ataxia progressing to fatal paresis. He explains this train of symptoms, which are ordinarily regarded as bromide poisoning, by a chlorine deficiency. It is most interesting to note that it was possible to save these animals by the injection of sodium chloride. They recuperated entirely in twenty-four hours with no sign of their previous serious condition. He believes that continuous administration of the bromides causes a considerable retention of bromine ions in the blood. Consequently sodium chloride is excreted in order to prevent the concentration of salts in the blood. The deficiency of the chloride leads to serious consequences, which may be relieved by the injection of normal saline solution. He applies his findings to the treatment of epileptics in the clinic. This is accomplished by the administration of bromides and the simultaneous reduction of salt in the food. Salt is absolutely prohibited, however, only in urgent cases, and then only for a short time. By this method the effect of the bromides is more rapidly obtained, and less amounts are required for efficient therapeutic results.

The Vaccine Treatment of Typhoid Fever.—WATTERS and EATON (*Med. Record*, 1909, *iii*, 93) report 30 cases of typhoid fever treated by vaccines. They noted, in many of the cases, a period of aggravation, the "negative" phase, followed shortly by a period of amelioration, the "positive" phase. Occasionally they were able to determine a very transient amelioration followed by the usual manifestations of the "negative" and "positive" phases. It seemed to them that the best results occurred in those cases in which a brief "negative" phase occurred. They had two deaths in the 30 cases treated. One of the fatal cases had been ill a month before the treatment was begun and was practically beyond help. This leaves one fatality in a case in which treatment was begun at the end of the second week. They believe that the earlier the treatment is begun the better the prognosis. They

say that the number of cases thus treated is, of course, too small to justify any absolute conclusions. However, the effects in the individual cases were so noticeable that it seemed wise to publish them in order to stimulate the use of the vaccines by other observers. The beneficial effects upon the temperature were notable, and they have included in their report the individual temperature charts.

The inoculations were made into the subcutaneous tissue overlying the biceps muscle and consisted of a stock emulsion of typhoid bacilli standardized and sterilized by moist heat at 60° C. for twenty minutes and by the addition of 0.3 per cent. of lysol. They gave it in doses of from 15 to 50 minims, the average dose being 25 to 40 minims. Judging from their own experience, they would advise its use in larger doses.

The Treatment of Gout by Thymic Acid.—FENNER (*Lancet*, 1908, ii, 1804) has obtained good results by the use of thymic acid in the treatment of gout. He believes that the use of thymic acid to hasten the elimination of uric acid rests upon a scientific basis. Thymic acid, as well as uric acid, is produced by the oxidation of the purin bodies. It forms a combination with uric acid which is soluble and which cannot be precipitated. He believes that uric acid normally circulates in the blood in this combination. In gout, he thinks, there is some fault with the combination of uric acid and thymic acid, though the amount of uric acid in the blood may not be increased above the normal. Therefore, if thymic acid can be supplied to the blood by ingestion or by any other means in sufficient amount to retain the uric acid in solution, any attacks of gout will be prevented. Thymic acid is now prepared synthetically, and Fenner advocates the daily use of 4 grains, taken after meals for a period of three months and then every alternate week, to prevent the onset of acute symptoms. He believes that it is especially suitable for the gradual prevention of acute exacerbations of chronic gout and for the gradual improvement of the symptoms of chronic or irregular gout. Thus he has found it particularly useful in the treatment of obesity, so often allied with gout, and in the manifestations of irregular gout, such as eczema, asthma, glycosuria, and stomach disorders. For the acute attack, thymic acid is not invariably successful and he prefers to use in such cases mercurials with colchicum or colchicum with aspirin. After the acute attack has subsided large doses of thymic acid should be given together with appropriate local treatment.

Some Indigestible Carbohydrates in the Digestive Tract.—MENDEL (*Zent. f. d. ges. Phys. des Stoffw.*, 1908, xvii, 641) reviews the literature concerning the nutritive value of carbohydrate foods which contain substances closely allied to cellulose and are chiefly derived from lichens and algae. Among these are Iceland moss, agar agar, Jerusalem artichokes, dulse, and salep. These contain various polysaccharides of complex structure, having the class name hemicellulose, which are more or less closely allied to one another. They are used for food in the regions where they naturally occur and have been advocated by many observers to supply the carbohydrate loss in diabetes. It is a well-known fact that the action of the enzymes which split up carbohydrates, is a specific one for the different polysaccharides. Mendel

does not believe that enzymes for the splitting up of these complex polysaccharides exist in the human economy. Consequently, he does not believe that their carbohydrate content can be hydrolyzed into the diffusible sugars. It is commonly understood that man cannot utilize cellulose because he is not provided with suitable digestive enzymes. The carbohydrates of the lichens and the algae seem to be allied in their chemistry closely to cellulose. There seems to be little reliable evidence concerning the digestibility of these carbohydrates, but that which we have is largely negative. A number of observations have been made with inulin. Levulose may be obtained from inulin by hydrolysis with acids. Since some diabetics tolerate levulose better than dextrose foods containing inulin have been recommended in the treatment of diabetes. Experiments have shown that salivary, gastric, pancreatic, and intestinal juices all fail to hydrolyze inulin. In addition, inulin, when fed to animals, does not increase the glycogen content of the liver as levulose does. It seems that the inulin is either not utilized at all or very slightly, and it is, therefore, not strange that clinicians should find no increase of glycosuria after its use. Similar results have been obtained with the polysaccharides derived from algae and lichens. Saiki examined a number of preparations of these classes in Japan, where they are widely used as food, and found that they are utilized very poorly for the purpose of nutrition. It has also been demonstrated that Iceland moss resists the action of the intestinal bacteria. Mendel suggests that further work should be done to ascertain the action of certain vegetable enzymes in hydrolyzing these polysaccharides. Mendel's own experiments showed that the greater part of these carbohydrates is excreted in the feces, unchanged. He attributes the good effects of agar agar in chronic constipation to this fact. Mendel believes that the results of the experimental studies should warn against the hasty acceptance of every carbohydrate foodstuff, as a food possessing a real nutritive value. The nutritive value of any food can be established only by accurate metabolic work. He adds that many of the group discussed form palatable accessory articles of diet both in health and disease.

Etiological and Therapeutic Researches in Pernicious Anemia.—REICHER (*Berl. klin. Woch.*, 1908, xli, 1838, and xlii, 1893) reviews the many different theories of the etiology of pernicious anemia and characterizes most of them as unsatisfactory, or at least questionable. He speaks most favorably of the hemolytic theory, and quotes the work of many observers which tend to support this view. These quoted observations have to do with anemias which are caused by different, though apparently related, substances. He speaks especially of the theories of the production of anemia by more or less closely allied lipoid substances. Considerable work has been done to point out the relation of a hemolytic substance as a cause of the anemias of the intestinal parasites. A similar explanation has been advanced to explain the anemia of carcinoma. He quotes the experiments of Keyes and Sachs, who prevented the hemolytic action of cobra lecithid in vitro by cholesterol. Reicher was able to cause a remarkable improvement in the anemia, produced by cobra lecithid by treatment with cholesterol, and thus he

was led to try cholesterol in pernicious anemia. Certain observers have found that when cholesterol is given by the mouth, the cholesterol content of the blood is raised. Others have found a diminished amount of cholesterol both in the red blood cells and in the serum of the blood of pernicious anemia. He used a 3 per cent. solution of cholesterol in hot olive oil. This solution remains stable when cold, but becomes cloudy. This cloudiness will disappear on warming. A few drops of oleum menthae will improve the taste. It should be given in tablespoonful doses, so that during the day 100 c.c. is given. The medication is well borne by the stomach. It should be given in oil, because when given in a watery emulsion it is quickly excreted in the feces. Reicher gives the detailed histories of four cases in which he used cholesterol with good results, and thinks that a larger experience will justify its more frequent use.

PEDIATRICS.

UNDER THE CHARGE OF

LOUIS STARR, M.D., AND THOMPSON S. WESTCOTT, M.D.,
OR PHILADELPHIA.

The Heart Lesions of Infancy and Childhood.—J. A. ABT (*Archives of Diagnosis*, 1908, i. 127) states that the first heart sound in children is normally louder than the second. Accentuation of the second pulmonary sound, if constant, is always a pathological sign. Accidental heart murmurs occur less commonly than in adults. Endocardial heart murmurs are usually soft, short, and blowing. Prominent causes are acute rheumatism, tonsillitis, chorea, pneumonia, and scarlet fever. Probably 40 per cent. of the cases are pure mitral regurgitation, while double mitral disease occurs in probably 30 per cent. of the cases, pericarditis in 20 per cent. The latter is a very grave condition and death results quite frequently either during the acute illness or is due to associated endocarditis and the pericardial adhesions. Endocarditis also offers a grave prognosis, especially in early childhood. Aortic insufficiency presents the gravest prognosis, mitral insufficiency the best.

Acute Anterior Poliomyelitis.—L. S. ARCHAMBAULT (*Albany Medical Annals*, 1908, xxix, 941) reports the case of a girl, aged ten years, in whom the use of the right arm was suddenly lost at the age of eighteen months. The child had been slightly feverish a few days prior to the onset of the paralysis, but there were no convulsions, no vomiting, no diarrhea, nor any other of the symptoms commonly observed in the initial stage of acute anterior poliomyelitis. For a time she was also weak in her feet. At the time of the report the child could perform all movements of the arm with the exception of the movements performed by the deltoid muscle. This muscle was totally disabled; it was completely wasted and did not respond to either faradic or galvanic stimulation, even though a very strong current was employed. There were no trophic or vaso-motor disturbances. The biceps was also slightly weakened.

The Value of Spinal Puncture in Diagnosis.—M. H. FUSSELL (*Archives of Diagnosis*, 1908, i, 176) describes the technique of spinal puncture thus: A sharp, hollow needle, three to four inches long, and a little smaller than an ordinary matchstick, is the instrument employed. Strict asepsis is enjoined. The patient should lie on his side with spine bent forward as much as possible and legs drawn up. The puncture is made close to the spinous processes between the second and third or third and fourth lumbar vertebrae. The needle should be held perpendicular to the spinal column, plunging thus through the skin; then the needle should be turned slightly upward and toward the centre; it ~~at~~ once slips into the spinal canal, but if not, it must be pushed in different directions until the aperture is found. If blood stops up the needle, the clot must be displaced with an obturating wire. Wherever the symptoms point to meningitis, this test should be performed. If done aseptically, it is a dangerless operation. Five cases are quoted; in one of these the examination of the fluid revealed epidemic cerebro-spinal meningitis; in one, tuberculous meningitis; one proved to be negative, one proved to be pneumococcal cerebrospinal meningitis; and the last was a staphylococcal meningitis following a middle-ear suppuration. None of these cases could be diagnosed definitely until after the spinal fluid was examined, and there was a great resemblance between several of them.

The Leukocyte Count of Normal "Institutional" Children and Those Suffering with Pertussis.—H. O. MOSENTHAL (*Archives of Pediatrics*, 1908, xxv, 831) made a number of leukocyte and differential counts at the New York Foundling Hospital of normal children and of others suffering with whooping-cough, and formulated the following conclusions therefrom. The average normal leukocyte count of "institutional" children is 13,850 to 16,391, somewhat higher than that usually given. The normal leukocyte count for these cases varies between extremely wide limits (29,600 and 7000). The percentage of various kinds of leukocytes in "institutional" children shows a slight diminution in the number of polymorphonuclear cells, with a corresponding increase of the mononuclears as compared with other figures. The percentage of polymorphonuclear cells increases with age in the same ratio as that given for other normal children. The percentage of eosinophile cells is within normal limits. During the catarrhal stage of pertussis an increase is seen in the leukocytes approximating double the normal, and the number of mononuclear cells is increased about 5.5 per cent. at the expense of the polymorphonuclear cells. In the convulsive stage similar, though less marked, changes occur in the blood count. Other cases, which have an afebrile cough but do not develop pertussis may show a hyperleukocytosis. When this is the case, there is a marked increase in the number of polymorphonuclear elements at the expense of the mononuclears. A hyperleukocytosis coupled with an increase in the percentage of mononuclear cells at the expense of the polymorphonuclears is a distinct aid in the diagnosis of pertussis during the catarrhal stage.

Scarlet Fever.—RUBENS (*Berl. klin. Woch.*, 1908, ^{Exlv}, 1886) believes the tonsils and pharynx to be the portal of entrance for the causal

agent of scarlet fever. The angina is usually necrotic, and the amount of mucus at times so great as to threaten the patient with asphyxia. He has never been able to cultivate diphtheria organisms from the throats of scarlet fever patients, whether the cultures were taken early or late in the course of the disease. Neither has he ever been able to see any benefit from the injection of diphtheria antitoxin. He therefore does not believe in the existence of diphtheroid cases of scarlet fever. When death occurs within a short time after the onset of the disease, he believes the cause to be the action of the toxin on the heart. The prognosis usually goes hand in hand with the severity of the angina. The treatment should endeavor to limit the throat disease, as thus is prevented the spread of the local condition to the larynx, to the submaxillary glands, and to the Eustachian tubes. He recommends for this insufflation of sodium soziodolium with sulphur, this to be done hourly day and night until the ulcers are clearing up. He keeps his patients in bed for four weeks, and gives whiskey the first few days to prevent cardiac syncope; after the fourth day his patients are given milk only, and nitrogenous foods are especially avoided.

The Local Treatment of Follicular Tonsillitis by the Use of Aspirin.—FETTEROLF (*Therap. Gaz.*, 1908, xi, 761) has used aspirin locally in the treatment of a large number of cases of follicular tonsillitis with very good results. After the mucus has been removed by a solution of sodium bicarbonate, finely pulverized aspirin is applied to the tonsil by means of a cotton swab. Care should be taken not to allow any of the aspirin to reach the larynx, since it may cause severe paroxysms of coughing. The aspirin should be applied to the apparently sound tonsil as well as to the inflamed one if the process seems to be unilateral. Ordinarily three applications at twelve-hour intervals will produce a fall in the temperature and a marked improvement in the local inflammation. Fetterolf thinks the local application of aspirin is also of diagnostic value, for if no improvement is apparent after the second application, the infection is probably not rheumatic.

The Urinary Findings in a Series of Infants Suffering from Intestinal Infection.—J. H. M. KNOX and J. C. MEAKINS (*Arch. Int. Med.*, 1908, ii, 241) have analyzed the urinary findings in a series of infants under constant observation in hospital wards because of diarrhoeal affections, to note the extent and frequency of renal complications in intestinal diseases. In 22 the urine was abnormal; it contained albumin and occasionally hyaline casts as the only pathological element in 7 instances (febrile or toxic albuminuria); in 7 others the presence of pus cells was the chief characteristic (pyuria-pyelitis); in the remaining 8 cases albumin, casts, and pus were all present, indicative of nephritis or pyelonephritis. The urinary changes were more frequent in ileocolitis, than in dyspeptic or fermental diarrhoea, though the extent of renal involvement seemed to depend less on the variety of the intestinal infection and more on its intensity. The pyuria persisted in some instances without apparently interfering with convalescence; in others it yielded to urotropin, and in still others it developed into a serious and fatal complication. The infection seemed to have its origin in the intestinal canal,

whence it reached the kidney either through the blood or lymph-streams, or by contiguity of structure. There was no evidence of involvement of the urethra or bladder or of ascending infection. The few autopsies made indicated clearly that although the kidneys frequently escape injury during enteritis, they become the seat of extensive secondary changes in this as in other forms of infection. The renal changes during intestinal diseases in infections seemed to be those of degeneration (parenchymatous, hyaline, and fatty) of the convoluted tubules rather than those of focal infection. In 19 cases suffering from ailments other than intestinal infection, and for the most part less acute in character, no urinary abnormalities were discovered.

Laryngitis Stridula.—R. RAHNER (*Münch. med. Woch.*, 1908, lv, 2139) had the opportunity of making careful laryngoscopic examinations in three children who had croup (laryngismus stridulus), a condition for which a number of explanations have been forthcoming. In all three patients he noted subglottic oedema. The next night he noticed a lessening of the swelling, and with it a decrease of the croupy cough, etc. The third night two of the patients again had more subglottic oedema, and two hours later the bellowing cough and other symptoms returned in their original intensity; the third patient, however, had no attack at all, the oedema having almost completely disappeared. Rahner feels justified in explaining the croup symptoms on this basis, but has no explanation why these attacks always come on at night.

O B S T E T R I C S.

UNDER THE CHARGE OF

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The Prognosis and Treatment of Puerperal Septic Infection.—HENKEL (*Zntralbl. f. Gyn.*, 1908, No. 42) considers it of the greatest importance in prognosis that the sort of germ causing the infection be recognized. Streptococci are often found in the secretions of the uterus without causing danger. When, however, they are recognized in the blood, prognosis is much more unfavorable, and the infection much more severe in proportion as the hemolytic condition is serious. When cultures upon agar during the first twenty-four hours yield abundant growth of streptococci with hemolysis, the prognosis is considered absolutely hopeless. Streptococci are often found in the urine of septic patients, and while cystitis does not invariably result it frequently does. As regards the general symptoms and prognosis, rapid pulse and high temperature are always unfavorable. In the local examination of such patients gloves must always be used, and care taken to avoid any wound, however slight, of the mucous membrane. Such wounds may introduce germs into the lymphatics and increase the patient's danger. Wounds

occurring during labor are also dangerous in proportion as they are made early; the longer labor continues the greater the danger. A very important factor in the prognosis of puerperal infection is the involution of the uterus; if this proceeds well prognosis is favorable. So far as treatment is concerned, it should be directed to reinforcing in every way the natural methods of resistance. When pieces of the membranes are retained, this in itself is not sufficient to justify dilatation and curetting. The only intra-uterine interference practised is a very gentle but copious douche given with a glass cannula, followed by packing the uterus with gauze soaked in quinine and alcohol. After decomposed amniotic liquid has been expelled this tampon is allowed to remain for not more than twelve hours. When the infection has spread beyond the uterus and is severe, it is well to extirpate the uterus through the vagina. So far as the use of serum was concerned the results were negative. Collargol also gave no good result. In puerperal pyemia, ligation of the veins of the broad ligament is the only operative procedure promising improvement. This should be done so soon as the diagnosis can be made. When the enlarged veins can be felt at the side of the uterus operation is indicated.

Sacral Anesthesia.—STOECKEL (*Zentrbl. f. Gyn.* No. 1, 1909) draws attention to the value of sacral anesthesia. The patient is placed upon the left side, with the lower extremities strongly flexed. The upper thigh is brought up to the abdominal wall. The index finger of the left hand marks the sacral hiatus, and in the fatty tissues the borders of this cleft may be marked with a sterile pencil. With the right hand a needle is introduced through the skin and carried slowly through the membrane into the canal. But little practice is required to make the injection accurately. If the needle passes into the periosteum it can readily be withdrawn and proper direction obtained. The injection is made slowly. If the skin becomes distended a false passage has been made and the fluid is being injected beneath the skin. The needle must be withdrawn and introduced again. But little, if any, hemorrhage accompanies the injection. There is very little pain if the injections are made with aseptic instruments under antiseptic precautions. The length of the needle varies from 2.6 cm. to 4.5 cm. The fluids injected are salt solution, novocain solution of varying strength, with and without adrenalin or suprarenin, eucaine and beta solution with or without suprarenin. The smallest quantity used was 3 e.c. and the largest 83 e.c., while the average was from 30 to 35 e.c. This injection was used in 141 cases, 89 primiparæ, 52 multiparæ. These were normal parturitions without complications. In 139 cases one injection was made; in 2 the injection was repeated. In 96 patients the injection was made during the period of dilatation. In 45 during the expulsive period. In 72 patients pains in the back were entirely removed by the injection. Pain in the back and abdomen as well yielded to injection in 39 cases; 23 patients complained of a sensation of fulness and tension about the anus, probably resulting from the irritation of a coccygeal nerve. In 9 cases the extrusion of the head was absolutely painless; in 16 cases very little pain was felt. Patients seemed to suffer far less and to be much more manageable after the injections. In 3 cases the

head was finally delivered with forceps, and in two a tear in the perineum was closed without suffering. In 2 cases patients felt so much pain when the forceps was tried that a few drops of chloroform were given in addition. Very evident relaxation of the muscles of the perineum and pelvic floor was observed in 4 cases. Injections began to affect patients in from three to five minutes. The effect persisted in a few cases a few moments only, and in some as long as six hours. When injections were made early in labor, uterine contractions seemed to be lessened in 23 patients. In one case in which pains were just beginning, uterine contractions ceased after the injection and did not return for four days. This suggested the use of this treatment in threatened abortion and premature labor. The action of the abdominal muscles seemed to be somewhat stronger after the injection than without it. In one patient the child's heart sounds became slower than normal, and the head was immediately delivered by an easy forceps application. In the third stage of labor, if atony of the uterus showed a tendency to develop, this was controlled by the addition of suprarenin to the injection. One-hundred of these patients lost less than 500 c.e. of blood; 33 less than 1000 c.e.; 6 more than 1000 c.e.; 2 more than 1500 c.e. The dose of suprarenin must not be too large, or an unfavorable result will be produced. No unfavorable effect upon the children was noticed. In the puerperal period, in one case, pains were experienced in the lumbar region; these disappeared spontaneously. It was interesting to note that retention of urine was not present in any of these cases; the use of the catheter was entirely unnecessary. In one patient 66 c.c. was injected by a false passage, causing phlegmon in the right gluteal region, which finally required incision and drainage. The bacteriological examination of the solution, supposed to be sterile, showed the presence of streptococci. In addition to these researches Stoeckel has tried this method in 5 cases of dysmenorrhoea; pain in the back was controlled, and pain in the abdomen was very much lessened. It seems probable that pain in the back from various causes can be controlled in this manner. An experiment was made by injecting into a patient with healthy kidneys 3 c.c. of weak methylene blue solution into the sacral canal, and then observing the discharge of this fluid into the urine by catheter placed in the bladder. The urine began to be colored within one hour after the injection and the coloring persisted for four days. Anesthetic solutions injected, begin to affect the patient within a few minutes after the injection, the effect disappearing in about an hour. These would indicate that the remedies act locally. The article is fully illustrated, and diagrams showing the course of the various sacral nerves and sacral canal are added.

Pregnancy Complicated by Hydatid Cysts.—BLACKER (*Jour. Obst. and Gyn. Brit. Empire*, November, 1908) reports the case of a patient who had attacks of abdominal pain, and who was supposed to have a fibroid tumor of the uterus, complicated by inflammation and adhesions. She was admitted to the hospital, eight and one-half months pregnant, the foetus living. On vaginal examination the cervix was pushed forward, and a soft round tumor filling Douglas' pouch reached to the level of the cervix. The tumor could not be pushed up out of the pelvis. The patient's general condition was good. As the tumor could not be pushed

out of the pelvis, it was thought impossible for labor to proceed, and the patient was delivered by the Porro operation. No attempt was made to remove the pelvic tumor, which was situated in Douglas' pouch, firmly attached to the surrounding tissues. The child was living and in good condition. The patient had some fever after operation. Most of the stump was removed on the ninth day, when pus was found in the wound just above the stump, and in a few days afterward a portion of the wall of a hydatid cyst appeared, followed by several small cysts. The patient became apparently infected, and her condition was diagnosed as iodoform poisoning through absorption. Hydatid cysts continued to be discharged through the sinus. The patient gradually recovered, but returned to the hospital about three months after operation, when more hydatid membrane was removed with pus. The tumor had evidently been a large hydatid cyst which had suppurred. Under drainage the tumor then discharged completely and the sinus closed. The operation was performed in 1896 at a time when the Porro operation was employed more frequently than at present.

Incarceration of the Pregnant Retroverted Uterus; Rupture and Recovery.

—CAMPBELL (*Jour. Obst. and Gyn. Brit. Empire*, December, 1908) was called to see a primiparous woman, four and one-half months pregnant, who had retroversion and flexion. Uterine contraction, pain, and external hemorrhage caused her to send for a physician. On inserting the hand into the vagina, a large opening led into the abdominal cavity, the hand passing between the posterior lip of the cervix behind and the bladder in front. The finger could be passed over the posterior lip and downward into the contracted uterus, which lay completely retroverted in Douglas' pouch. On passing the hand upward above the pelvic brim, the foetus in the unruptured membranes was found free in the abdominal cavity. The membranes were ruptured, the foetus, placenta, and membranes rapidly extracted. Large coils of small intestine prolapsed into the vagina. They were replaced and the opening packed with gauze. An external pad of sterile gauze and cotton was then applied. Four days afterward these drains were removed, and the vagina packed with iodoform gauze. The patient during convalescence maintained a semisitting posture in bed. She recovered with considerable tenderness and pain in the lower abdomen for the first week of the puerperal period.

G Y N E C O L O G Y.

UNDER THE CHARGE OF

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Malignant Melanoma of the Vulva.—E. HOLLAND (*Jour. Obst. and Gyn. Brit. Emp.*, 1908, xiv, 309) selects the name malignant melanoma for the melanotic tumors of the vulva which have a malignant nature,

instead of melanotic sarcoma, because frequently they are carcinomatous, Holland found recorded but 37 cases of malignant melanoma of the vulva. The ages varied from thirty-three to eighty years, the decades at which the largest number occurred were the sixth and seventh, an equal number occurring in these two; 73 per cent. were over fifty years. Child-bearing seems to have no influence, an equal number occurring in nulliparae as in women who have given birth to seventeen children. Of the 37 cases 12 began in the labium majus, 6 in the labium minus, 6 in the labium minus and clitoris, 3 in the clitoris, 1 in the mons veneris, 1 in the urethra, and 8 were extensive over the vulva. The condition of the inguinal glands was mentioned in 31 cases, in 25 of which they were affected. The duration of the disease varied from six to eighteen months in the 24 cases available for study. In 35 cases the tumor was excised, in 26 of which the after history shows 19 deaths. In 4 others recurrence is noted, and in 3 non-recurrence is mentioned, in 1 beyond three years. In 33 cases microscopic examinations were made, the findings being in 26 melanotic sarcoma, in 6 melanocarcinoma, and in 1 the nature was not definitely decided. Holland believes malignant melanoma does not necessarily arise from pigmented moles.

Abscess of Gaertner's Canal.—TATE (*Amer. Jour. Obst.*, 1908, lviii, 841) refers to the paucity of the literature on abscess and other pathological processes in this duct, and then relates a case of abscess of Gaertner's canal that was treated by him. Tate finds no cases reported other than one each by Kelly and Routh.

Malignant Tumors of the Ovaries.—GARDNER and McCLEARY (*Surg., Gyn., and Obst.*, 1908, vii, 669), after a careful study of malignant ovarian tumors, advocate the early removal of all ovarian tumors, because primary carcinoma of the ovary usually begins in a benign growth, and an early operation removes a prolific source of malignancy. Even when the malignant process has made considerable progress there is an excellent opportunity to effect a complete cure. Ovarian tumors, according to Gardner and McCleary, should be removed through an abdominal incision sufficiently long to allow the tumor to escape without breaking the cyst wall, as was advocated by Washington Atlee and now recommended by J. Bland-Sutton.

Enormous Ovarian Cysts.—O. J. FAY (*Surg., Gyn., and Obst.*, 1908, vii, 515) reports a case of enormous ovarian cyst in a woman, aged fifty-four years, the presence of which she had known twenty-one years. She had given birth to five children, the last labor occurring thirteen years previously. Although bedridden during the last year and much emaciated, her weight was 270 pounds and her waist circumference seven feet and three inches. Nausea and vomiting and edema of the legs were prominent symptoms. During the first ten days of her visit to the hospital the abdomen was tapped three times, 150 pounds of fluid being withdrawn. The cyst, markedly adherent and having four large and several small compartments, was removed. The patient died of pneumonia, which developed a month after the operation.

Ovariectomy during Pregnancy.—C. G. CUMSTON (*Amer. Jour. Obst.*, 1908, lviii, 26) records 5 cases he has treated, and reviews the literature on the subject. Statistics show that 19 per cent. of ovarian tumors complicating pregnancy are dermoid cysts, and that the percentage rate of dermoids among ovarian cystomas is 4. This marked difference, 19 and 4 per cent., is due to the slow development of dermoids and their characteristic tendency to remain in the pelvis, from which they are forced upward by a growing uterus. Not all surgeons will endorse his attitude in performing ovariectomy by the vaginal route, as additional danger of spreading infectious or malignant material from breaking the tumor coats, but manipulations of the uterus are necessarily increased and abortion, consequently, rendered more frequent.

Vaccine and Serum Treatment of Gonorrhœa in Female Children.—BUTLER and LONG (*Jour. Amer. Med. Assoc.*, 1908, li, 1301) treated by the vaccine method 25 female children between the ages of one and one-half and twelve years suffering from gonorrhœa, and 5 children, 1 with the acute and 4 with the chronic form of the disease, with the serum method. In summarizing the results Butler and Long state their belief to be that gonococcus vaccine is more effective in the treatment of gonorrhœal vulvovaginitis in children than are local applications, which, in some instances actually delay recovery. The vaccine treatment is very effective, especially in chronic and subacute varieties of the disease in which rapid improvement is noted. The most effective dosage varies in the same child and in different children. The serum treatment is not recommended.

Etiology of Ectopic Gestation.—C. D. WILLIAMS (*Surg., Gyn., and Obst.*, 1908, vii, 519) offers the following suggestions to be considered in the study of the etiology of ectopic pregnancy: (1) A histological examination of the implicated, as well as the non-implicated, Fallopian tube is of more value than simple clinical observation. (2) Clinical examination of the structures may reveal no evidence of an inflammatory reaction nor of anatomical malformations which, however, are possible of demonstration by microscopic examination. (3) Macroscopic examination may show no adhesions surrounding the Fallopian tubes, whereas, microscopically, the mucosa and muscularis of the same tubes may show the evidences of a pre-existent inflammatory reaction. (4) In all of Williams' specimens evidences of an inflammatory reaction, which had preceded the onset of the ectopic gestation, were demonstrable. The observations of Opitz in a series of 23 cases coincide with those of Williams. (5) Schauta, Küstner, Duhrssen, and others believe that predisposition to a tubal pregnancy depends upon a previous inflammation in the tubes and that in most cases it is due to a gonorrhœal infection. With these conclusions Williams agrees. (6) An infection of the gonococcus of Neisser more than any other kind of infection predisposes to the formation of the false diverticula. A tuberculous process does not produce the ideal conditions for the retention and especially for the development of an ovum in the tube. (7) The inflammatory changes in all cases in which both tubes were removed were shown microscopically to be bilateral, and diverticula were present not only in the tube

which lodged the ovum, but also in the opposite one. (8) From an exhaustive study of the subject and from the analysis of a series of cases Williams believes that the presence of these false mucus-lined channels or diverticula produced by an inflammatory reaction in the tubes is the chief predisposing cause of tubal pregnancy in at least 95 to 98 per cent. of all cases.

Fibromyoma of the Uterus and Anemia.—SCHENCK (*Jour. Amer. Med. Assoc.*, 1908, li, 1395) discusses this subject, insisting that anemia is a potent factor in the production of thrombosis and embolism during convalescence from hysterectomy for fibromyomas. Schenck believes no percentage of hemoglobin should be declared as the minimum for hysterectomy, as in some instances it is very low, and yet hemorrhage that cannot be controlled prevents all efforts to raise it. Believing fibromyomas of the uterus are congenital, Schenck is unwilling to accept the four theories proposed by others to account for the cardiovascular changes in patients having such tumors, which are: (1) Alterations in the vascular system are primary, and the cause of fibroids; (2) the presence of the tumor leads to increased aortic tension and other circulatory disturbances which affect the heart; (3) myoma is not a local affection, but a general disease, with a triad of symptoms consisting of tumors, nervous manifestations, and general vascular disturbance; and (4) a toxin circulates in the blood which causes both the uterine tumor and the heart degenerations.

DISEASES OF THE LARYNX AND CONTIGUOUS STRUCTURES.

UNDER THE CHARGE OF
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Atrophic Rhinitis.—PORCHER (*Jour. South Carolina Med. Assoc.*, December, 1908) states that in the treatment of atrophic rhinitis he administers potassium iodide in large doses, up to 800 and 900 grains a day, unless the scab formation eases under less dosage. He also cleanses the passages with hydrogen peroxide and then applies Lugol's solution.

Ozena, Atrophic Rhinitis, and Purulent Suppurative Sinusitis.—CURTIS (*Laryngoscope*, December, 1908) reports upon the successful results obtained by injecting the nasal cavity with the lactic acid secreting bacillus of Masson. He claims that this is the best means at our command in combating ozena, accompanied by crust formation, and for the tropical treatment of suppurative disease of the ethmoid cells and of the frontal sinus. Not only does the culture act on the pathogenic bacilli in the nasal and accessory cavities, but the active solution

contains a product which has a pronounced effect upon the vasomotor system of the nose.

Ethmoid Perforation of the Inner Corner of the Eye and Involvement of the Antrum of Highmore.—WELTY (*Jour. Amer. Med. Assoc.*, October 17, 1908) reports a case in a man, aged seventy years, who had always been healthy and had for only two weeks noticed a swelling over the right eye which had increased in size daily; but there had never been any discharge from his nose, and he had a good sense of smell and no odor in the nose. Probe puncture of the antrum brought a large quantity of offensive and cheesy pus. The parts were cleaned out, and careful search made for the bony fistula, but it could not be found at that time. Three weeks later it was found to be posterior and above and on the inner side of the eye. The Killian operation was performed. The antrum of Highmore was found completely filled with polyps, granulation tissue, and cheesy pus, which was very offensive. There had been such extensive destruction of bone that the antrum extended to the median line of the hard palate, and as much of the bone of the hard palate as remained was as thin as paper. Convalescence was rapid.

The Surgical Treatment of Hay Asthma, Spasmodic Coryza, and the Like.—YONGE (*Lancet*, June 13, 1908) and BOURGEOIS (*Progrès méd.*, No. 38, September, 1908) report successes by section of the nasal nerve immediately before its division at the level of the anterior ethmoid foramen.

Diphtheria Bacilli in the Throats of the Apparently Healthy.—MYER SOLIS-CORREN (*Jour. Amer. Med. Assoc.*, January 9, 1909) reports the presence of diphtheria bacilli in the throats of many healthy persons who had been in contact with patients suffering with diphtheria in orphanages, homes, public schools, and private dwellings. He contends that cultures from the throats of all the inmates of the house where diphtheria exists should be examined to determine whether they are carriers of the contagion or not. He is of the opinion that despite the rigid disinfection of the houses and their contents, little progress need be expected in the prophylaxis of diphtheria so long as the animate carriers of contagion are neglected.

Intracranial Lesions Consecutive to Nasal and Accessory Sinus Infections.—COAKLEY (*Jour. Amer. Med. Assoc.*, January 9, 1909) succinctly discusses meningitis, epidural abscess, sinus thrombosis, and brain abscess, consecutive to nasal and accessory sinus infection, and describes what is known as the ethmoid route as the most satisfactory technique in exploring the sinuses when operation is indicated.

Osteochondroma of the Septum Narium.—MYLES (*Laryngoscope*, December, 1908) reports a case of osteochondroma of the septum, with extensive absorption of the cribiform plate. The tumor extruded into the cranial cavity and into the sphenoid and ethmoid cells. This was in a man who had had an operation performed upon his nose

ten years previously. Under cocaine and morphine-hyoseyamin anesthesia the growth was removed by external aeeess after one external earotid artery had been tied, and a temporary ligature had been placeed upon the other. It was found that prolongations of the tumor had extended into the sphenoid and ethmoid eells and into the orbital and cranial eavities. The patient made an uneventful reeovery.

DERMATOLOGY.

UNDER THE CHARGE OF

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The Etiology of Lupus Erythematosus.—SENGER (*Dermat. Zentralbl.*, July, 1908), having found by previous experiments that an ointment of old tuberculin, 1 to 10 or 20 of vaseline, when placeed in eontaet with lupus or other tubereulous dermatoses, produced specific inflammatory reaection eomparable with the von Pirquet and conjunetival reactions, has tried the same procedure with erythematous lupus. He elaims to have obtained a positive reaection by placing such an ointment in eontaet with patches of erythematous lupus; and concludes aecordingly that this affection is tubereulous.

The Cutaneous Symptoms of Human Trypanosomiasis.—DARRÉ (*Ann. de dermat. et de syphil.*, No. 12, 1908) describes at length the symptoms of trypanosomiasis as manifest upon the skin, basing his description upon the study of twenty cases of sleeping sickness observed in Europeanis. Among the early symptoms of this affection the cutaneous manifestatios oceupy an important place, having, on account of their freqeency and their special aspect, great diagnostic value. In some cases the bite of the tse-tse fly is followed by a more or less sharp inflammatory reaection. Some hours after the bite, in one or more points upon the skin, redness and swelling appear accompanied generally by a sensation of burning or, at times by real pain. The next day a little tumor appears, or a red, violaceous, rounded spot a little elevated above the surrounding skin the size of a franc piece. These lesions, occupying the sites of bites, are found upon the nape of the neck, the legs, the knees, the flanks, the axillary region, and are always accompanied by painful swelling of the neighboring lymphatic glands. Darré believes they are the result of the introduction of some irritating substance into the skin, secreted by the fly, or of inoculation of some of the ordinary organisms, such as the staphylococcus. These lesions, while not actually exceptional, are quite infrequent. In the fully developed disease two types of eruption are observed: vesicopapules

accompanied by itching, and nonpruritic, polymorphous, urticaria-like erythemas; these two varieties may co-exist. Pruritus is a frequent symptom, and following it a papulovesicular eruption appears, which consists of small deep-red papules having small vesicles upon their summits.

The polymorphous erythemas are very frequent, Darré having noted them in 12 out of 20 cases under his observation. They occur in all stages of the disease, and are sometimes present very early. Their morphology varies, the erythema sometimes occurring in sheets, sometimes in rings, the latter being the more frequent. The seat of predilection is the trunk, especially the back, although they are likewise seen upon other parts of the body. Their evolution is variable; at times they are transient and recurring, but more frequently they last for weeks and months, varying in intensity, but never disappearing except under the influence of proper treatment. These erythemas are by no means characteristic, and their diagnosis would be very difficult if one did not know that the patient had come from a region in which sleeping sickness was prevalent. In every case the clinical diagnosis ought to be confirmed by a microbiological examination. Microscopic examination of the blood obtained at the site of the eruption by means of very superficial scarification will sometimes give positive results. The treatment consists in the employment of hypodermatic or intramuscular injections of atoxyl, giving 0.50 gram every five days.

The Nature and Treatment of Eczema with Leg Ulcer.—FRANCKE (*Archiv. f. Dermat. und Syph.*, 1909, xciii, Heft 1 and 2) advances the novel view that eczema is an infection having its origin upon the genitalia, with a primary, secondary, and tertiary stage. As the first symptom he finds small vesicles situated upon the glans penis, the inner surface of the prepuce, and in women, upon the vulva, together with some red points in the neighborhood which are accompanied by marked itching. Later the skin of the genitalia shows an eruption consisting of redness, papules, and vesicles. The last stage of the affection consists of an eczema involving all parts of the body, especially the hands and feet, and ulcer of the legs. Francke would place eczema in the same category with gonorrhœa, soft chancre, and syphilis, and believes that, like these, it is contracted in sexual intercourse. As to the treatment, he regards creosote internally as the remedy *par excellence*. With the appearance of itching upon the genitalia he applies compresses to the parts wet with a solution of resorcin 5 to 200. When the eczema has spread to other parts of the body, especially the hands and feet, baths of hot water containing 2 to 5 grains of creosote to a liter and a half are to be employed. Under this internal and external treatment improvement takes place in a few days; the baths are applied less frequently and are eventually replaced by a 10 per cent. resorcin paste. [Francke's view concerning the infectious nature and sexual origin of eczema are hardly to be taken seriously since they are not supported by the clinical facts. His statement that the genitalia are the most frequent site of eczema does not agree with the experience of the majority of dermatologists.—M. B. H.]

PATHOLOGY AND BACTERIOLOGY.

UNDER THE CHARGE OF
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monstration of Tubercl Bacilli in the Sputum.—In a comparative of the different methods of demonstrating tuberele baeilli in the um, ELLERMANN and ERLANDSEN (*Zeitschr. f. Hygiene u. Infek-skrankh.*, 1908, Ixi, 219) claim that their "double method" is the for deteeting the baeilli in eases in which they are difficult to find.

is a combination of two methods of reducing the sputum to a more suitable form for examination, one depending on bacterial action and autodigestion by the pus cells (so-called "autodigestion method"), the other on the solvent effect of sodium hydrate. The tehnique is as follows: (1) 10 to 15 c.c. of the sputum to be examined is mixed with one-half its volume of 0.6 per cent. solution of Na_2CO_3 , and kept in the thermostat for twenty-four hours at 37° C. (2) Most of the supernatant fluid is poured off, the preeipitate eentrifuged, and the remaining fluid poured off. (3) Four volumes of 0.25 per eent. NaOH is added to one volume of the prcipitate, carefully stirred, and boiled. (4) The mixture is centrifuged and the sediment examined in the usual way for tubercle bacilli. For less complieated proeedures in laboratories, where many examinations have to be made daily, the authors recommend the autodigestion method, represented by steps one and two of the above desription, or Hempel's simpler method, which merely consists in heating the sputum for four to eight minutes in a waterbath at 65° to 75° C., to break up the mucus, then centrifuging and making the smear from the sediment.

Typhoid Bacilli in Stomach Contents Containing Bile.—Utilizing a contribution of Volhard, who showed that after ingestion of 200 e.e. of oil, bile appeared in the stomaeh, WEBER (*Münch. med. Woch.*, 1908, lv, 2443) investigated the stomaeh contents of patients who had typhoid or paratyphoid baeilli in the stools. He found that half an hour after taking the oil, bacilli were present in large numbers in the stomach contents of two eases of typhoid and one of the paratyphoid baeillus carriers. At the same time the stools showed very much fewer baeilli. The organisms were isolated also from stomaeh contents that had stood twenty-days at room temperature. The author suggests that this may be an easier and surer method of disovering baeillus carriers, especially as Kayser has shown that the investigation of the stools is uncertain and that baeilli may reappear at intervals after being absent for some time. This method may be of use also in testing patients before leaving the hospital, to find out if they still harbor the organisms in their gall

bladders. A disadvantage is that the bile does not always occur in the stomach contents after such a procedure, and then the stomach contents is free from bacilli. The test has not as yet been used extensively.

Reflex Cardiac Arrhythmia.—KOBLANCK and ROEDER (*Arch. f. d. ges. Physiol.*, 1908, *xxxv*, 377) have undertaken experimental investigation of a phenomenon observed clinically and reported upon (*Deut. med. Woch.*, 1908, No. 24) by one of the authors, who studied a case of cardiac arrhythmia which was apparently due to changes in the nasal mucous membrane. Eight cases of cardiac arrhythmia were subsequently cured by electrolysis of the nasal mucosa. Although the myogenie theory of the heart beat is well grounded, the nervous system plays an important regulatory role, and it is often difficult to determine which of the regulatory factors is at fault in given cases of arrhythmia. The authors add to the numbers of factors already considered responsible for cardiac arrhythmia a swelling or irritation of a certain region of the nasal mucous membrane. In a series of experiments they stimulated the nasal mucosa mechanically and chemically in dogs and rabbits. Arterial pulse curves were taken. They found a definite spot in the nasal mucosa high up on the septum, the stimulation of which was followed by a definite, well-marked arrhythmia. Various other points in the nose, and points in other parts of the body were stimulated without producing any effect on the heart rhythm, but the authors do not believe that the "Herzstelle" in the nose which they describe is the only point where reflex disturbance of the heart rhythm may be produced, but that this is the point of predilection. Arrhythmia was produced in a dog and in a man during a "nose-bleed," which ceased when the nose was freed from the blood that rested between the middle turbinate and the "Herzstelle," and adrenalin was found to stop the "nose-bleed" and cure the arrhythmia at the same time. This drug effected arrhythmia due to swelling of the mucous membrane of the nose, and electrolysis of the spot resulted in a disappearance of the arrhythmia. The nervous path from the nose to the heart was investigated by stimulation after cutting the vagus and the second branch of the nasal trigeminus, and the authors conclude that the vagus is not the only path by which this reflex travels. The reflex is, however, absent after the second branch of the trigeminus is cut. The arrhythmia was observed in the exposed heart in which both the auricles and the ventricles were seen to be affected by this form of arrhythmia.

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